METAL INDUSTRY

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Powder Metallurgy

By CHARLES HARDY

Charles Hardy, Inc., New York

A New and Extremely Promising Development in Metal Manufacture

DURING recent years a new art in the metal industry has been forging ahead. Probably "Powder Metallurgy" is as good a name as any for this new development. Except in expert circles it is not generally realized that the metallurgy of pure tungsten and molybdenum is a Powder Metallurgy. These metals are produced in powder form through the reduction of their oxides, and not by melting or refining their ores. The powders are compressed into bars and sintered, and the resulting bars are then rolled, swaged, drawn, etc., like any other metal.

The reason for this method of operation is mainly the fact that the melting points of both these metals are so high (W. 3400° C.; Mo. 2620° C.) that the melting and refining methods of other metals would be a very costly operation.

A fair amount of literature dealing with the metallurgy of tungsten and molybdenum exists. It is, however, not generally known that Powder Metallurgy is applicable to other metals of ordinary melting temperatures and that the advantages of this Powder Metallurgy are becoming more evident as new applications are found for it.

Powders have been produced by various methods, such as grinding, atomizing, reduction of oxide or replacement of other metal salts by precipitation, etc., and of late, by electrodeposition. The size and grain structure of the powders play a very essential part in Powder Metallurgy. It is here that the development during the last few years has made great strides, also a greater knowledge of the effect of heat treatment has greatly contributed towards improvement.

This development is now out of the laboratory stage. Powdered metals are now produced and consumed in quantities.

Powder Metallurgy has the advantage that it allows the production of finished metal parts by compression and heat treatment. Components can be used which are not readily soluble in each other in their liquid state, or whose melting points are very high, or where the melting points of the metals forming the desired alloy, are too far apart.

COMMERCIAL SHAPES MADE FROM POWDERED METALS

Molybdenum Ingot Pressed from Powder and Swaged. | Molybdenum Sheet Pressed from Powder and Rolled. | Resistance Metal Rod—Cu. 50, Ni. 50. | Flanged Bearing, Cu. 90, Sn. 10, Graphite 1 to 3. | Bronze Rod, Cu. 90, Sn. 10. | Copper-Chromium Contact Part. | Conical Ferrule Cu. 90, Sn. 10.

Again, compounds can be produced from metals and non-metallic compounds; also constituents of varying crystal structure. Alloys can be made of, predetermined percentages. No slag losses, oxidation and gas interference need be considered. For instance, a 90% copper, 10% tin alloy, very difficult to secure in exact percentage by casting, is readily obtained by this method. The finely divided metals, by control of grain size and structure allow a very even distribution, a predetermined density and other characteristics not possible under hitherto employed methods.

The Powder Metallurgy has a number of other advantages. Finished products of various shapes ready for consumption can be produced without encountering the difficulty of high casting temperatures. Such metal pieces can be produced from pure metals or even from alloys, where the cast metals are not suitable, due to their not being susceptible to modification through rolling, drawing, and pressing. Their production requires generally much lower temperatures and a very much reduced consumption of energy. The chemical influence of the material, which in the molten metal is of great importance, does not appear in Powder Metallurgy, as these reactions are eliminated by the absence of a liquid state of the material and the use of low temperatures in the sintering process.

Furthermore, porous bodies with changeable characteristics, differences in specific gravity, electrical conductivity and resistivity, can be made by this method.

The economics of this method of production have been studied and ways and means been developed to allow Powder Metallurgy to take its place alongside the older field of operation. Presses have been designed to apply the compression fast and effectively at from 5 to 250 tons per square inch. Automatic feeding of the dies no longer offers difficulty. Finished pieces have been compressed, at rates varying according to size, up to 5,000 pieces per hour. The die cost per piece is reduced to a minimum. Further progress in this direction is now being made by the use of dies made from the ordinary metals, but with special wearing parts, insets from such hard compounds as carboloy, etc.

Heat treatment has been investigated and allows of very widely varying methods to obtain the best results, according to the ultimate aim desired.

The compressed metals can be given the same characteristics as cast or forged metals, if any subsequent working takes place after compression and heat treatment.

The importance of this Powder Metallurgy and its growth is probably best demonstrated by the fact that close to 500 million pieces so produced were used in 1931. The field covers a variety of uses such as porous and non-porous bushings, bearings, contact points, welding anodes, welding rods, struts, alloy steels, alloy irons, tungsten copper, copper chrome, silver nickel, silver molybdenum and other compositions.

The conviction of prominent companies as to the future possibilities of this field, and the amount of research for new applications that is now carried on, give promise of a great future for this comparatively new type of metallurgy.

The Theory of Chromium Plating

By Prof. Erich Muller*
Dresden, Germany

1. Pure Cr acid is not electrolytically reducible in aqueous solution in spite of its strong oxidizing action; but it is if SO_4^{--} ions are present. Through the sketching of a cathodic current potential curve, through determination of the interrupted potential, and through an exhaustive discussion, the results obtained were coordinated with the formerly given theory that the cathode is covered with an invisible, non-conducting, fine-pored layer which the reduction of the Cr acid effects.

2. This layer is disrupted by SO_4^{--}. It is ascertained that this disruption takes place only after a certain cathode potential is reached, and therefore, the conclusion drawn is that in order for the SO_4^{--} to cause disruption, it must be drawn electrostatically through the covering.

3. The difference in the behavior of the Pt and Cr cathodes can be explained in the light of this theory; also a previous hypothesis on the irregular behavior of the platinized Pt and the C cathode is maintained.

* A brief abstract of a series of articles by Prof. Muller and his associates, Per Ekwall and J. Stecherbakow, in Zeitschrift für Elektrochemie, 34; 399 (1926); 34; 84 (1929); 35; 222 (1929). The work was done largely at the University of Leipsic, but lately at the Sächsische Technische Hochschule, Institut für Elektrochemie und Physikalishe Chemie, in Dresden. The articles have been translated in full by J. Williams of the Roessler and Hasslacher Chemical Company Library, Niagara Falls, N. Y.

Acid Pickle

Q.—We are interested in obtaining information on both sulfuric acid (10%) and hydrofluoric acid (4%) pickling baths for malleable iron castings.

Our problem is to determine by simple tests when each of these pickling baths is spent and must be discarded or, if possible, how they can be renewed. Undoubtedly this would require practical methods of analysis for determination of impurities as iron and silica and for the free acid content of each solution. Data on the maximum amounts of impurities and the minimum amount of free acid desirable for efficient pickling would also be necessary.

A.—When a sulfuric acid pickle for steel has less than 8% free acid, it works slowly and is not economical. When the iron content is from 10-12 ozs. per gallon the solution should be discarded. The iron sulphate can be crystallized and the liquor returned to the pickling vat. This is only advisable in large steel plants. Analytical control is advisable. There are no data regarding hydrofluoric acid pickling baths. —G. B. H.

Correction

In our April issue, on page 144, under the heading "Forming Tubes," the last paragraph stated that the Institute of Metals, Otis Building, 810 18th Street, Washington, D. C., would furnish literature on this subject.

This was in error. It should have read that W. M. Corse, at that address, would furnish this literature

Effect of Temperature on Physical and Casting Properties of No. 12 Aluminum Alloy

By GEORGE H. STARMANN
Chief Metallurgist, Apex Smelting Company, Chicago, Ill.

Proof of the Harm That is Done By Soaking the Metal and Pouring it at Too High Temperatures

NOTWITHSTANDING the fact that considerable research has been done by laboratories of various producers of aluminum, as well as Government agencies, on the effects of various melting and pouring temperatures on aluminum, nearly all of these tests were restricted to virgin aluminum and its alloys. Due to the rapid development of the aluminum industry, the use of aluminum other than virgin has increased to a very significant extent, particularly in foundries manufacturing castings for automobiles, household utilities, transportation equipment, and numerous engineering and ornamental applications. A survey indicated that nearly 85% of foundries in 1931 consumed remelt alloys in their practice, the bulk of which was the casting alloy, commercially known as No. 12 grade.

In my investigation, a standard grade of No. 12 was selected, the analysis being typical of the grade sold and used by the majority of foundries. Several analytical checks were made to detect any segregation present. Extreme care was used in melting and making sand molds for test bars. Absolutely uniform conditions prevailed on all tests. Temperature readings were made with carefully adjusted instruments, frequently calibrated.

The following table gives analysis of the metal used:

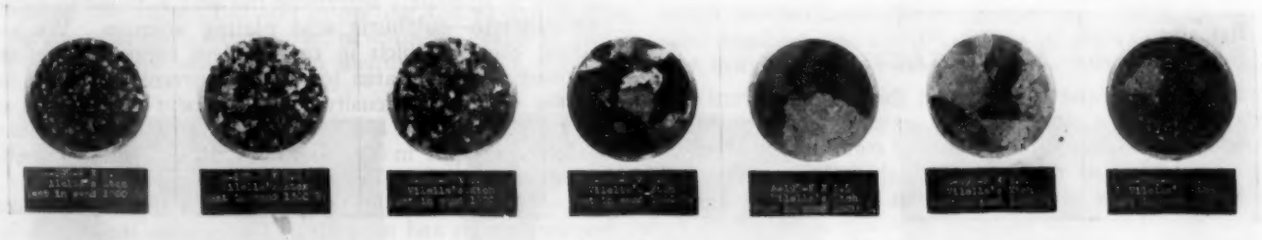
Copper	7.32%
Zinc	1.06
Iron	1.00
Silicon	1.62
Aluminum	Remainder

In this paper, I will attempt to show the effects of overheating and uncontrolled melting practice and its accompanying disadvantages. All test bars were cast in sand and poured at temperatures designated.

Physical Properties of No. 12 Alloy Cast at Varying Temperatures.

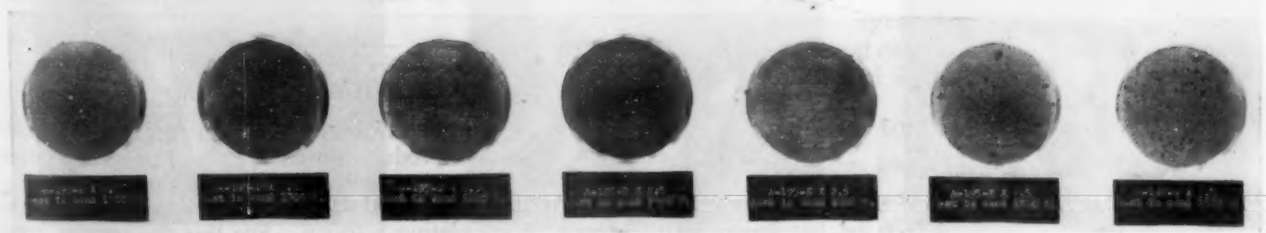
Cast at	Tensile strength per sq. inch	Elong. in 2"	Impact lbs. per sq. inch	Brinell	Specific gravity
1200°F.	21,846 lbs.	1.2	34.11	53	2.8874
1300°F.	21,338 lbs.	1.25	32.59	49	2.8821
1400°F.	20,740 lbs.	1.05	33.61	48	2.8730
1500°F.	17,125 lbs.	.90	25.41	49	2.8535
1600°F.	15,866 lbs.	.45	27.49	48	2.8558
1700°F.	14,679 lbs.	.45	19.86	46	2.8238
1800°F.	13,932 lbs.	.43	18.84	43	2.7497

MACROGRAPHS OF No. 12 ALUMINUM ALLOY CAST IN SAND AT VARYING TEMPERATURES



1200°F. 1300°F. 1400°F. 1500°F. 1600°F. 1700°F. 1800°F.

SERIES 1, ETCHED



1200°F. 1300°F. 1400°F. 1500°F. 1600°F. 1700°F. 1800°F.

SERIES 2, UNETCHED

From the foregoing figures, it is evident that after 1300°F., with each increase of 100°F., in casting temperature, there is a relative decrease in the tensile strength, an indication of increasing weakness. The elongation decreases in approximately the same ratio, the impact figures are indicative of brittleness, and the decrease in Brinell is proof of diminished hardness. The decrease in specific gravity plainly shows the presence of increased porosity.

It is a generally accepted fact that metal poured at a high temperature will heat the mold to such a temperature that the rate of cooling is very slow, resulting in a coarse, crystalline structure. This danger does not prevail in sand castings alone, as superheated aluminum poured in iron or steel molds will show practically the same results in loss of strength and increased porosity.

A contributing cause, in my opinion, of this condition is dissolved or occluded gases (hydrogen predominating) and also oxides. This will show up in pin holes, spongy spots, and scattered cavities in the castings.

As indicated in the accompanying macrophotographs (Series 1) it will be noted that the size of the crystals increases with the increase in temperature, and it is natural, therefore, to assume that the gradual decrease in tensile strength and other physical properties can be attributed to the change in crystalline structure, together with the increase in porosity, as indicated in macrophotographs (Series 2). It also might be said that so often, when foundrymen blame the quality of metal for cracking, hot shortness, and excessive shrinkage, as well as brittleness, these are in reality caused by abnormally large crystalline structures created by excessive heating.

For any given melting temperature above 1300°F., the crystals are definitely coarser. The eutectic becomes more pronounced in metal poured at that temperature than in metal cooled to the proper pouring temperature.

My investigation included tests to verify a number of prior tests made by several laboratories on the question of whether superheated aluminum can be corrected by cooling it down to the proper pouring temperature. On a melt brought to 1700°F., cooled quickly to 1260°F., and then poured, test bars check as follows:

	Average
Tensile Strength	20,421 lbs. per square inch
Elongation	1.15% in 2 inches
Brinell	46.
Specific Gravity	2.8474

It must be borne in mind that this result is from small laboratory melts, and I do not extend these conclusions broadly to melting under industrial conditions. However, it is evidence that the effect of high melting temperature is markedly less harmful than that of high pouring temperature. The inconsistencies generally occur where high temperatures are being employed, indicating that soaking at high temperatures has an effect upon the metal not produced by soaking at normal temperature. For instance, metal held for two hours at 1500°F., and poured showed:

	Average
Tensile Strength	15,846 lbs. per square inch
Elongation.....	.85% in 2 inches
Brinell	40.
Specific Gravity	2.8163

Held for two hours at 1260° F., and poured, it recorded:

	Average
Tensile Strength	20,976 lbs. per square inch
Elongation.....	1.10% in 2 inches
Brinell	45.
Specific Gravity	2.8644

The question of proper pouring temperatures has been and probably always will be a foundry problem. It is not the writer's intent to convey in this article the impression that recommendation is made to pour all castings at one temperature. In actual foundry practice this would be practically impossible, as temperatures must be applied to suit the nature of the castings produced. A complicated casting with thin sections cannot be expected to fill out properly when poured at same temperature as heavy, even-section castings. It is recommended, however, that extreme caution should be used in melting practice and that the lowest possible pouring temperature be employed in the melting of metal, and wherever possible, large gates be used to compensate for reduced fluidity due to lower temperatures.

Proper melting and pouring temperature involves matters of such great importance that it is necessary to employ every possible precaution in order to produce consistently uniform and sound castings. I cannot stress too much the disadvantages of soaking metal, especially at high temperatures, and the inadvisability of uncontrolled melting and pouring.

Recent Developments in Electrolytic Zinc

By Arthur Zentner*

Consulting Metallurgical Engineer, New York

This is a statistical paper comparing the progress of electrolytic zinc from 1920 to date with the zinc produced by the old retort method. According to the writer's figures, electrolytic zinc has shown, and should continue to show a steady proportional growth. It has climbed from 10.56 per cent of the total production in 1920 in the United States to 27.31 per cent in 1931. In world production, electrolytic zinc has increased from 7.91 per cent in 1920 to 32.74 per cent of the total in 1931.

*A paper read at the 14th Annual Meeting of the American Zinc Institute at St. Louis, Mo., April 18, 1932.

Protecting Racks

Q.—We are desirous of obtaining information on a method to accurately determine the area exposed to a copper sulphate—sulphuric acid plating solution. We use plating clamps which in time collect copper, therefore exposing a greater area to a given current. A small reduction in current density is a detriment to our type of work and we would like to check the exposed area before the clamp is put in the solution. Each clamp normally has about 10 square inches exposed.

A.—In all probability the deposit on the anode holder becomes rough and modular. There is no simple way by which such a surface could be measured. It is suggested that a rubber covered rack be made with removable contact points. In this way the size of the exposed part of the rack could be maintained within fairly narrow limits.

—G. B. H.

"Imitation Gold Plate"

Q.—I would like to have a formula for a plating solution which will produce am imitation gold plate on either silver or brass; the solution not to contain any gold.

A.—There is no imitation gold solution except a high-copper brass plating solution. For this the regular brass plating solution formula is used, except that it is prepared with a copper content of 90 to 95 per cent. The anodes should be 90 per cent copper, 10 per cent zinc.—G. B. H.

Foundrymen Are Meeting in Detroit

An Interim Report of the Sessions on Non-Ferrous Metals and Allied Subjects.

AS we go to press with this issue, the American Foundrymen's Association is holding its meetings in Detroit, May 2nd-5th inclusive, at the Statler Hotel. A complete program of the non-ferrous sessions and other meetings of interest was published in our April issue, pages 138-139. We give, therefore, abstracts of those papers which have so far been pre-printed. A full report of the meetings will appear in our June issue.

Below are shown also the portraits of some of the men who are taking a prominent part in the sessions on non-ferrous metals.

PHOSPHORUS IN RED BRASS

By R. W. Parsons

Metallurgist, Ohio Brass Company, Mansfield, Ohio

The author reports his observations on the effect of phosphorus on brass and bronze with special reference to slight traces of approximately 0.01 to 0.02 per cent. It seemed to the author that these amounts of residual phosphorus would be considerable in semi-red brass alloys of the modified 85-5-5-5 variety having zinc in excess of 5 per cent. The alloy particularly studied had a composition of 81.5 per cent copper, 3 per cent tin, 7 per cent lead and 8.5 per cent zinc. Phosphorus as a deoxidizer is first compared with various other possible deoxidizers. Experimental work described was undertaken to determine underlying cause of excessive leak losses which resulted from the presence of greenish-colored inclusions in thin sections of valve castings. The data secured gave evidence to indicate that phosphorus in red brass actually serves as a deoxidizer in addition to making the metal fluid and protecting the molten stream during pouring. Copper, in new metal heats, is principal source of oxygen when melting is under reducing conditions and either remelting or an addition of phosphorus is necessary to remove oxides and produce sound castings free from inclusions.

THE INFLUENCE OF DESIGN ON BRASS AND BRONZE CASTINGS

By Lewis H. Fawcett

Metallurgist, U. S. Naval Gun Factory, Washington, D. C.

The author stresses the attention which should be given the designing of castings in relation to foundry production. Selection of the alloy to be used is important, as is the determination of molding position to prevent shrinkage. Composition of some bronzes and brasses used by the Navy Department are given, together with the required physical properties. The fundamentals of design are discussed and many examples of poor design are shown with improvements which can be made to overcome the defective design. Evenness of metal section is stressed as of the greatest importance in securing sound castings.

MATERIALS HANDLING IN THE SMALL BRASS FOUNDRY

By D. G. Anderson and B. F. McAuley

Western Electric Company, Chicago, Ill.

The engineers of the Hawthorne works of Western Electric Company were given the task of reducing costs and securing better quality of castings in the brass foundry. Because of the foundry being of medium size, careful studies were made to determine improvements which would surely prove economical. Equipment for sand handling and mold handling of the continuous type was installed and electric melting furnaces were secured.

R. W. PARSONS
Author of Paper on Phosphorus in Brass

H. F. SEIFERT
Advisory Committee, Non-Ferrous Division

L. H. FAWCETT
Author of Paper on Brass and Bronze Castings

The paper describes in detail the sand-handling and sand-conditioning equipment, methods of pouring and handling molds, and cleaning arrangements. Results have been such as to justify the methods installed in this, a small brass foundry.

GRAIN SIZE AND BOND DISTRIBUTION IN SYNTHETIC MOLDING SAND

By A. H. Dierker[1]

Research Engineer, Engineering Experiment Station, Ohio State University, Columbus, Ohio

This paper deals with the problems of determining the bonding material distribution on the sand grains. To make actual physical tests of bond distribution is difficult, so the author was led to investigate bond distribution by the use of the microscope. Under ordinary conditions it is difficult to distinguish under the microscope between the appearance of the bonding material and the sand grains. Immersing the sample in refractive oil, however, causes the clay to stand out in relief, and its distribution can be determined satisfactorily. Thus the proper time for milling the synthetic sand mixtures can be determined. The length of time depends on the size of the sand grains. In those sands studied this time ranged from 3 minutes to over 14 minutes. Results of various attempts at measuring surface area of sand grains are given and discussed.

HOW MUCH DOES IT COST TO TRAIN FOUNDRY APPRENTICES?

By J. Franklin Carlz

Assistant to Vice-President, Clark Brothers Company, Olean, N. Y.

Believing that by training apprentices is the only way to get a sufficient supply of skilled foundrymen, with a flexible organization, less labor turnover, and to provide a training school for potential foremen, an apprentice course was established on a definite basis in 1927. The paper brings out the cost of training foundry apprentices, and detailed costs are given, the total cost per year per apprentice being given as $176.54. The conclusion is reached that when comparing production cards with rates of pay and expenses of training on company time, the program is more than paying its way. Complete training schedules are listed.

Platers' Convention Committee Reports Progress

Hotel Accommodations—Tentative Program of Technical Papers—Plant Visits

THE COMMITTEE in charge of preparations for the 1932 convention of the American Electroplaters' Society is steadily progressing toward the arrangement of a program and all other details which indicate this will be one of the finest annual meetings ever held by the organization.

The convention, as previously announced, will be held at the Benjamin Franklin Hotel, Philadelphia, Pa., June 20 to 23, inclusive.

George Gehling, convention director, has just issued the following information in addition to the data given out last month:

Headquarters will be at the Benjamin Franklin Hotel, 9th and Chestnut Streets, Philadelphia. Registration will begin there on Sunday afternoon, June 19, and the registration committee will be on hand to take care of incoming members and guests. They will be prepared to supply information on accommodations and all other details pertaining to the welfare and comfort of everyone.

Technical Program

The technical program, under supervision of Dr. Hiram S. Lukens, Harrison Laboratory, University of Pennsylvania, will include the following papers, as well as others not yet ready for listing:

Electrodeposition of Tungsten from Alkaline Solutions, by Dr. L. Kahlenberg and M. L. Holt, University of Wisconsin.

Peeling of Electrodeposited Nickel, by E. A. Vuilleuvnier, of Dickerson College.

Review of Recent Foreign Literature Relating to Electro-Plating, by M. deKay Thompson, of the Massachusetts Institute of Technology.

A Study of Base Metals in Industrial Chromium Plating Applications, by Lieut. Arthur Willink, of the Frankford Arsenal.

Plating of Zinc Base Die Castings, by R. J. Wirshing of the General Motors Corporation.

Plating on Zinc, by W. M. Peirce, of the New Jersey Zinc Company.

Electroplating Zinc on Aluminum, by Harold K. Work, of the Aluminum Company of America.

Barrel Plating—Particular Reference to Optimum Loads and Costs, by Gustaf Soderberg, Udylite Process Company.

Anodes for Zinc Plating, by Dr. A. K. Graham, University of Pennsylvania, and G. B. Hogaboom, Hansen-Van Winkle-Munning Company, Matawan, N. J.

Plant Visits

The following plant visits have been decided upon:

General Electric Company.
United States Navy Yard, Air Craft Division.
DeLong Hook and Eye Company.
Philco Radio Company.
R. C. A. Victor Radio Corporation.
Curtis Publishing Company, Plating Department.

There will also be trips to the University of Pennsylvania Museum, where there will be exhibits of bronzes restored by the electroplating process.

A more complete program will appear in the next issue.

Other convention news will be found an advertising page 30 of this issue.

The Bessemerization of Bell Bronze

By JOHN B. KASEY
Research Metallurgist, New York

The Separation and Recovery of Copper and Tin Metal.—Experiments with Various Fluxes in a Smelter in Soviet Russia

FOR economic and other reasons the problem of recovering metallic tin from bell bronze was one of importance, which the Nonferrous Metals and Gold Research Institute of Moscow, U.S.S.R., was called upon to solve. The insignificant and undeveloped sources of tin ores as well as the need of all available foreign moneys and gold for other than tin metal purchases compelled the utilization of the comparatively large potential supply of tin, in alloy form, in the bells of the nation's churches.

Numerous methods had been given trials, but of these, only electro-disintegration and bessemerization were found to give some promise of success. The extremely low efficiency with common electrolytes relegated electrolysis to the background.

Numerous bessemerization experiments had been carried out in both laboratory and plant, but none could seem to overcome the exceedingly high copper losses in the slags. After having reviewed the past work, it became clearly apparent that of the many influencing factors, the composition of the slag former or flux was of paramount importance, for upon its viscosity depended the ease or difficulty with which oxidized copper could be returned to the metal by making it give up its complement of oxygen to the equivalent of unoxidized tin and thus bring to a minimum the seriously high copper losses.

Of the small list of commercially practical fluxing materials of low melting point and satisfactory physical condition when molten, sodium carbonate (soda ash) was selected as the best, because the stannate formed, as the tin oxide dissolved, easily remained in the liquid condition at 1,200°C. With regard to the effect of either Cu_2O or CuO on the liquidity of the slag, it was felt that no serious trouble would be experienced since cuprous oxide itself melts at a temperature below that employed and cupric oxide forms a possible low melting point cuprate of soda.

Alumina, dissolved from the sides of the clay-sand crucibles, was the most detrimental compound, for its soda salt has a high melting point, thereby unduly decreasing the liquidity. Dissolved alumina also makes subsequent reduction of tin-copper slags to metal difficult, and regeneration of the flux impossible. Silica, too, is dissolved in abundance, but the soda can take up as much as three times its molecular quantity without seriously impairing the liquidity; and it is possible that this silica in combination with stannic oxide as stanni-silicate of soda has lower melting points, but this was not determined.

Obviously, the use of soda ash on a commercial scale would make necessary the employment of dolomitic or magnesite linings, or the addition of silica to the soda ash flux in such proportions as to give either hemi-, mono-, di-, or tri-silicates and thus lessen or entirely eliminate the corrosion of acid linings. Indications when using hemi-silicate flux pointed to mono-silicate or di-silicate fluxes as being the most suitable, satisfying nearly all conditions. However, both of them are still unsaturated with respect to either silica or alumina and can take up additional quantities. But the rate of dissolution and absorption is slow so that if the time of bessemerization is short, very little additional silica or alumina will be taken up. Eventually, both silicates will become fully saturated so that their liquidity will be decreased unless additional soda ash is added to restore it.

The experiments were all carried out in clay-sand crucibles, because magnesite crucibles were not available for the purpose. Naturally, the corrosion of the crucibles was serious, and all of the slags contained from 15 to 20 per cent of alumina and even larger amounts of silica besides that intentionally added. Such slags would always contain more copper than those of greater liquidity, and make subsequent reduction to metal more difficult.

Bessemerization was carried out with the aid of a small, motor-driven air compressor, a calibrated mercury manometer for measuring the volume of air injected into the crucible by means of a long, unglazed porcelain tube of narrow bore, and a gas-fired crucible furnace.

The table on page 186 gives the results of bessemerization in tabulated form.

The first four experiments are separated from the other two shown, because they were made almost solely to illustrate the speed of oxidation and the efficiency of bessemerization of the tin. The liquidity of the fluxing compositions and other factors remained about the same. The other two experiments confirm the bessemerization efficiency even when other factors vary greatly.

Bessemerization efficiency, based on the comparison between the removal of a certain quantity of tin by a theoretical quantity of air and that actually used, should be considered in the light of other influencing factors. Of these, perhaps depth of charge, slag viscosity and time are the most important. With proper depth, oxygen removal from the air inflow easily reaches completion, oxidizing both tin and copper simultaneously. With proper slag liquidity, which means good circulation, the mixture of tin and copper oxides dissolves rapidly, the tin forming a stannate and remaining fixed while the copper oxide rapidly gives up its oxygen to the tin at the contact surface of metal and slag. The factor of time would exert its maximum influence even when only the theoretical volume of air is injected into the mixture. Of course, in practice this may not be feasible, except if retreatment costs are in excess of the cost of the time involved to allow the selective oxidation to complete itself.

But upon slag fluidity rests the success or failure of any process of selective separation, as in this case. It is of interest to note that copper losses in these more or less basic slags are very small in comparison with the total amount of copper present originally. Even where

BESSEMERIZATION OF BELL BRONZE

BRONZE COMPOSITION: Sn, 20%; Cu, 80%

LITRES AIR PER MINUTE—3.87

Experiment No.	Wt. of Alloy (Bronze) Taken		Grs. Tin Contained	Grs. Copper Contained	Theoretical Quantity of Air to Form SnO_2 Litres	Actual Quantity of Air Blown in Litres	Fluxes Used Grams	Minutes of Blowing	Bessemerization Efficiency %	TIN						COPPER				REMARKS
										In Metal		In Slag		Volatilized (By Difference) Of Total		In Metal		In Slag (Prills, Oxide, Etc.) Of Total		
	Grams	% of Mix.								Grs.	%	Grs.	%	Grs.	%	Grs.	%	Grs.	%	
1	500	68.6	100	400	111.8	58.1	NA_2CO_3—178.0 SiO_2—50.5	15	75.8	60.95	13.50					389.2	86.50	10.75	2.69	Slag is of excellent liquidity. Faint green when cold.
2	500	68.6	100	400	111.8	116.2	NA_2CO_3—178.0 SiO_2—50.5	30	76.0	24.1	6.10					370.9	93.9	29.1	7.28	Excellent liquidity Brown slag
3	500	68.6	100	400	111.8	174.2	NA_2CO_3—178.0 SiO_2—50.5	45	51.2	20.4	5.1	61.1	19.72	18.9	18.9	379.6	94.9	19.0	4.75	Excellent liquidity Fibrous Light-green slag
4	500	78.9	100	400	111.8	309.7	NA_2CO_3—133.5	80	35.2	2.7	0.75	76.5	27.5	20.8	20.8	358.0	99.3	41.5	10.4	Slag becomes viscous toward finish, because of solution of large amounts of silica and alumina
5	530	94.1	106.0	424.0	118.0	135.5	NA_2CO_3—21.0 SiO_2—12.0	35	57	36.6	9.50					348.4	90.5	39.6	9.35	Slag has good liquidity, but still dissolves silica and some alumina
6	557	97.5	111.4	445.6	124.0	193.6	Silica only. 55.8 Grs. to form meta or ortho silicate Actually added only 14.0 Grs.	50	49.5	25.2	6.15		Very Small		Major Part	384.8	93.85	60.8	13.7	Slag is highly viscous, enclosing uncombined silica and much copper shot

the time of blowing is 80 minutes and the volume of air almost three times the theoretical with the tin content reduced to 0.75 per cent, the copper loss is only 10.4 per cent—slag content of copper being only 14.84 per cent; whereas, customary operation with acid slags gives copper losses up to 45 per cent and slags of 35-40 per cent copper content. (See experiment No. 6, silica flux).

The distribution of the tin in the metal, slag, and as fume can be readily controlled, depending whether a residual alloy satisfactory as a machine bronze (Sn—5, Cu—95) is desired, a very low-tin copper for subsequent production of electrolytic copper, a high tin-low copper slag for further processing, or a relatively pure tin fume which can be smelted immediately to pure metal. As machine bronzes were and are in demand, enough tin was left unoxidized to yield such alloys, the remainder being slagged or fumed. By employing a minimum of flux most of the oxidized tin is driven off as fume. And even with a rather deep covering of liquid flux, about 20 per cent of the tin escapes slagging.

For recovery of the tin metal from the impure slags simple reduction by means of coal or coke to an alloy very high in tin and low in copper and then bessemerizing this alloy to drive off the tin metal as a fume is the best procedure. But for the most economical practice, the use of a minimum of flux and the evolution of at least 75-80 per cent of the tin as fume would save the intermediate steps of reduction and bessemerization mentioned above, except for that small portion of the tin which is slagged.

Metal yields from slag reductions were always very good, except when excessive amounts of alumina and silica were present, making settling of metallic shot and prills difficult. In such cases, regeneration of the flux suffered also. Commercially and with basic linings, reduction to metal and regeneration of the flux would become a simple matter, permitting appreciable economies. The following flow sheet gives the steps of the process.

Flow Sheet of Process of Recovering Metals from Bell Bronze

How to Handle Nickel Solutions

By E. SCHOR
Plating Expert

Practical Points on the Prevention and Cure of Troubles Which Beset the Nickel Plater

NICKEL plate, to be good, should be at least 0.0025" in thickness, and be tough enough to stand bending at right angles on half hard, cold rolled sheet steel. Also 16¾ grains in weight per ampere hour should be deposited.

It is no easy task to manage a nickel solution. It has, as a rule, not had the correct amount of study and care it requires. The old saying, "Cleanliness is next to Godliness," applies to nickel solutions. Rods, connections and all other materials used in the plating room should always be clean.

In all my years as a plater, I have had very little trouble with pitting. This is not because I am a better plater than any one else, but because I am careful. I have plated on brass, copper, steel, tin, stereotype metal and also graphited lead molds for electrotypes. Solutions must be looked after carefully if they are to be kept in good condition.

The Care of Anodes

Should you examine the anodes at the end of a heavy day's work, you will find that usually a heavy scum of oxide has formed. The question now arises, "Should the scum be left on them to fall to the bottom of the bath, or remain on the anodes, or should it be removed?" If it is allowed to fall to the bottom, there will surely be trouble caused, such as pitting on the surface of the work being plated. If we do not allow it to fall, we will have other troubles, since it obstructs the passage of the current (from the anodes) which at all times should pass freely into the solution. Since no advantages are to be gained by allowing the scum to fall to the bottom of the bath, or to remain on the anodes, I would advise platers to remove it at once. By doing this you ask for no trouble and receive none.

When the anodes are completely coated, there will be no deposit at all, because the anodes are insulated from the solution, the crystals being non-conductors of electricity. To remove the crystals, place the anodes in hot water. This will dissolve the salts and the solution may be added to the nickel bath.

How often have you seen helpers at the factory ready to wash and clean up at the end of a day's work, sometimes even standing all dressed and ready, waiting for the whistle. I would urge all platers in charge to see that the helpers under them make it their business, at the end of a day's work, to examine and clean the anodes, if they should require cleaning. This will probably save an hour's loss of time, or even more, the following day.

Other troubles might arise by the constant removal of water which adheres to the work as it is being taken from the solution. When the solution is dense, the anodes will become coated with crystallized nickel salts and it will be impossible to obtain a good deposit.

When nickel baths are worked very hard, they become depleted of their metal content. It becomes necessary therefore, to build them up from time to time with more metal. Nickel anodes should at all times be as pure as possible, in order to feed the solution properly.

Work That Falls Off the Racks

The next problem I will discuss is that of dealing with work that has dropped to the bottom of the solution. This may seem a small matter in some cases, but when brass or copper has dropped to the bottom and has been allowed to remain, a certain proportion of the metal is dissolved. If the pieces are allowed to remain in the tank for too long a time, the contamination becomes great and will eventually lead to the destruction of the solution. Copper is very harmful in the nickel solution, and great care must be taken to keep it out. It will not only cause a dull deposit, but also black streaks.

The Care of Nickel Solutions

If the solution is plating badly, the trouble generally arises from one of three causes: (1) The solution may be too acid; (2) too weak; (3) have too poor a conductivity. When the solution becomes too acid it should be reduced with water. The solution should then be saved after being taken out in order for it to be added to the bath as occasion requires. Then add from 1 to 2 ounces of single nickel salts and 2 ounces of sal ammoniac per gallon of solution. This will freshen the solution and increase its conductivity, which is probably lacking.

Platers should also test their solutions from time to time to make certain the density and composition are correct. All solutions have the bad habit of evaporating, whether used cold or hot. Solutions should be filtered at least once every two months. This will go a long way towards keeping them in good condition.

Plating Die Castings

Nickel plating on die castings is a class of work in which much care has to be exercised. No matter what condition the bath may be in, black streaks will be evident unless the right voltage is registered. The best method to adopt in plating this work is to use a high voltage for a few minutes, then reduce for the rest of the time the article is plated.

Precautions in Nickel Plating

Some things one should look for in plating nickel are:

1. Satisfy yourself that all work, previous to immersion in the nickel solution, is perfectly clean.
2. Take care also that the voltage is the same throughout the deposition, except when on first immersion a sufficient voltage is given to secure a uniform deposit on all the articles.
3. If it is necessary to copper-plate the base metal previous to nickeling, rinse well after coppering, in clean water, so as not to carry any of the copper solution over to the nickel solution.

All-Around Nickel Solution

I have found the following solution best for general work:

Water	1 gal.
Double nickel salts	8 oz.
Single nickel salts	4 oz.
Sal ammoniac	2 oz.
Boracic acid	3 oz.

British Institute of Metals Meeting

Abstracts of Papers Read at the Twenty-Fourth Annual General Meeting, Held in London, March 9th and 10th, 1932—Conclusion*

NOTE ON THE INTERACTION OF ALUMINIUM AND WATER VAPOR, by RICHARD SELIGMAN and PERCY WILLIAMS.

The statement having been made recently that aluminium and its alloys are rapidly attacked by super-heated steam at 300° C., the authors have made experiments, and have found that no such attack takes place under the conditions which they define.

THE SOLUBILITY OF ALUMINIUM IN MAGNESIUM IN THE SOLID STATE AT DIFFERENT TEMPERATURES. By Professor P. SALDAU and M. ZAMATORIN.

The solubility of aluminum in magnesium of 99.68 per cent purity has been determined at temperatures up to 420° C. The solubility limit at room temperature is 6.08 per cent aluminium by weight, and this is maintained unchanged until 300° C. after which a rapid increase occurs, the solubility line passing through 10.9 per cent by weight of aluminium at 400° C., and intersecting the eutectic line (436° C.) at the point corresponding with 12.6 per cent aluminium by weight.

OBSERVATIONS ON THE PRESSURE OF FLUIDITY OF ANNEALED METALS. By HUGH O'NEILL and HUBERT GREENWOOD.

The pressure of fluidity at room temperatures has been designated as the stress at which a loaded rigid punch continuously penetrates a block of ductile metal. Examination of such a partly-punched specimen by hardness tests after sectioning, reveals that the most highly strained regions have a (Meyer) ball index value of $n = 2.0$ and a resistance to indentation equal to the pressure of fluidity. The value of the latter for a given specimen can therefore be determined by a cone or ball test after cold-working the material to the greatest possible extent by rolling. Furthermore, it appears that the minimum pressure required to extrude a metal through a die under certain conditions is equal to the pressure of fluidity, and very roughly equal (in most cases) to twice the Brinell number of the annealed metal.

The suggestion is made that the condition of "critical plasticity" observed by Tresca, Kick, Coe, and others, in the course of compression tests, corresponds with the condition of "necking" in tensile tests. "Necking" commences at the point of maximum **load,** and tensile diagrams on Stead's principle indicate that the true **stress** on the section from this point (P_M) to that of fracture, has a linear relation to the decreasing diameter of the test-piece. Extrapolation then gives a stress (P_a) at which theoretically the diameter would be reduced to zero by tensile straining. The available experimental evidence suggests that approximately: $P_a = 3\ P_M$ = the pressure of fluidity. Tensile, compression, indentation, and punching tests have thus all been related to the pressure of fluidity.

1 mm. ball tests have been made on annealed metal wires, and on the same specimens after heavy cold-rolling. In this way their pressures of fluidity were determined. The minimum stress required to draw the wires at a speed of 0.001 in. per minute through tungsten carbide dies giving 20 per cent reduction of area was then measured. The pressures of fluidity prove to be about 25 times the magnitude of the minimum drawing stresses for these conditions, but if the wires are placed in a series of increasing values for each of these two tests, then the sequence in each series is the same.

THE TESTING OF CASTINGS by WALTER ROSENHAIN.

The paper summarizes some of the principal points under discussion in regard to the testing of castings. Attention is confined to what is termed specification testing and control testing, leaving aside investigatory testing. Ideal methods of non-destructive testing being as yet unavailable the application of the usual mechanical tests to castings is considered. The use of actual castings, or pieces cut from them for such tests, or the alternative use of specially cast test-bars, is considered in view of the fact that the properties of castings frequently vary from place to place in the same piece. The author favors the adoption of a separately cast test-piece, the use of small samples cut from actual castings being reserved for investigatory purposes. The use of chill-cast and sand-cast test-bars is discussed with special reference to the forthcoming adoption of a standardized sand-cast test-bar for the light alloys of aluminium. Reference is also made to the difficulty of determining small percentage elongations; and the author's suggestion that the practice followed in cast iron testing of using bending tests in which deflection is measured as a means of testing ductility, is described. Reference is also made to the discussion on the Testing of Cast Iron which took place at the Zürich Congress of the New International Association for Testing Materials: and the author's summary of that discussion—prepared by him as Chairman—is given as an appendix to the paper.

In conclusion, the author discusses the value of tensile testing and the desirability of improving methods of testing in the interests both of the user and the manufacturer.

* Part 1 was published in our April issue.

Electrochemical Society Meeting

Abstracts of Papers on Metals, Electrodeposition, Corrosion and Electric Furnaces Read at the 61st General Meeting, Baltimore, Md., April 21-23, 1932

THE new officers of the Electrodeposition Division elected at the convention of The Electrochemical Society are **Charles H. Eldridge,** Detroit, Mich., Chairman; **O. P. Watts,** Madison, Wis., Vice-Chairman; **Arthur H. Kopp**, Metropolitan Museum of Art, New York City, Secretary-Treasurer.

Abstracts of papers delivered are given below.

SELENIUM AND TELLURIUM

By S. Skowronski and M. A. Mosher

Research Department, Raritan Copper Works, Perth Amboy, N. J., and Superintendent, Silver Refinery, Raritan Copper Works, respectively.

The metallurgy involved and the methods employed in the removal of selenium and tellurium from the copper refining cycle, as well as a description of the recovery processes for the commercial production of these metals, are briefly presented. Supplementing this, notes and tables are given on selenium and tellurium production; their commercial uses; their effect on the conductivity of copper; and the electrodeposition of tellurium. A review of the bibliography of selenium and tellurium is appended.

THE APPLICATIONS OF THE ROCKING INDIRECT ARC ELECTRIC FURNACE

By A. E. Rhoads and Carl H. Morken

Respectively, Vice-President and Foundry Engineer, Detroit Electric Furnace Company, Detroit, Michigan.

The applications of the rocking indirect arc electric furnace are described and discussed at length. The range of operations is very wide due to the highly diversified uses to which this rocking electric furnace has been applied. In the non-ferrous field, virtually every type of brass and bronze product in domestic or commercial use is represented. In ferrous melting, the application of the rocking furnace has been rapidly adopted because of the many advantages peculiar to this type of furnace in the manufacture of any product requiring high quality, unusual physical characteristics or close control. The rapidity with which the American gray iron foundryman has adopted electric furnace practice is indicative of the fact that gray iron castings produced under adequate facilities for control have become recognized as an engineering material.

THE DEOXIDATION OF COPPER WITH THE METALLIC DEOXIDIZERS, CALCIUM, ZINC, BERYLLIUM, BARIUM, STRONTIUM AND LITHIUM

By Earle E. Schumacher and W. C. Ellis

Metallurgists, Bell Telephone Laboratories, New York City.

There is a disadvantage in the use of metallic deoxidizers in that the excess metal in most cases alloys with the copper and diminishes the conductivity. To reduce this effect to a minimum, it is necessary to know within close limits the oxygen content of the copper prior to deoxidation. The effect of the deoxidizers **calcium, zinc** and **beryllium** expressed in terms of equivalent oxygen are plotted. The curves show that calcium is somewhat superior to either zinc or beryllium in regard to the effect of the residual deoxidizer on the electrical conductivity. Both **barium** and **strontium** are satisfactory deoxidizers for copper. In addition, these elements appear to have a very limited solubility in copper, and therefore decrease the conductivity but little. It is doubtful if at the present time either of these elements could be used commercially on account of their high cost. **Lithium** deoxidizes copper satisfactorily, but has definite limitations in that it combines rapidly with the oxygen of the air and reduces some refractory oxides.

GALVANIC CORROSION

Possible Galvanic Effects in the Corrosion of Metals in Milk

By W. A. Wesley, H. A. Trebler and F. L. LaQue

Respectively, of the Research Laboratory, The International Nickel Company, Inc., Bayonne, N. J.; Research Laboratory, National Dairy Products Corporation, Inc., Baltimore, Md.; Development and Research Department, The International Nickel Company, Inc., New York City.

A study is first made of the galvanic effects which occur when dissimilar metals are coupled together in hot aerated pasteurized milk. The following metals and alloys, used commercially in the construction of milk pasteurizing equipment, are included: Nickel, copper, aluminum, chromium-nickel and chromium-nickel-iron.

It is next pointed out that galvanic corrosion can occur, due solely to a difference in temperature of identical metal surfaces exposed to a given solution. A cell of this nature is studied with nickel electrodes in milk. It is concluded that the temperature effect is of little importance under pasteurizing conditions, and that in this instance the galvanic effect of differential aeration can be of greater influence than that of temperature difference.

THE ELECTRODEPOSITION OF TERNARY ALLOYS OF COPPER, CADMIUM AND ZINC FROM CYANIDE BATHS

By R. C. Ernst and C. A. Mann

Respectively, Assistant Professor of Chemical Engineering, Speed Scientific School, University of Louisville; and Professor and Chief of Division of Chemical Engineering, University of Minnesota.

The theories and principles involved in the simultaneous electrodeposition of two metals from aqueous solutions are reviewed and extended to the co-deposition of the three metals copper, cadmium and zinc.

The electrolysis bath adopted consisted of the following salts in grams per liter:

Copper cyanide—40.01 g. (28.5 g. copper).
Cadmium cyanide—2.94 g. (2.0 g. cadmium).
Zinc cyanide—36.14 g. (20.10 g. zinc).
Potassium cyanide—138.0 g. (3.75 per cent excess potassium cyanide).†

It was desired to secure a deposit of a color comparable to brass with approximately 60 per cent copper, 20 per cent cadmium and 20 per cent zinc. The electrolysis bath operating at 25° C. with a current density of 0.3

† Excess potassium cyanide refers to that amount of potassium cyanide in addition to that theoretically required to form the complex salts. This amount was required for complete solution.

amp./per sq. dm. gave deposits of the approximate composition 62 per cent copper, 21 per cent cadmium, and 17 per cent zinc.

The effect of potassium cyanide, sodium bisulfite, sodium hydroxide, current density, temperature and dilution on the composition and properties of the cathode were studied in detail. The effect of these variables is summarized in tables and curves.

THE DISTRIBUTION OF CORROSION

By S. C. Britton and U. R. Evans

Respectively, 103 Grantchester Meadows, Cambridge, England, and University, Cambridge, England.

Specimens of iron and zinc, freshly immersed in salt solutions, commence to suffer attack preferentially at places where the primary, air-formed oxide-film is imperfect. Generally, however, on vertical specimens placed in stagnant solutions of sodium (or potassium) chloride (or sulfate), this primary distribution rapidly passes into a secondary distribution, dictated by differential aeration, in which there is one large unattacked area near the water line, with an (anodic) etched region at the bottom and near the cut edges. The state of the original primary film may have a somewhat more lasting effect on the distribution of corrosion in the case of specimens shaken in potassium sulfate solution, since the oxygen is then supplied to all parts of the specimen. Under stagnant conditions, the effect of the state of the primary film is usually transitory, but it may help indirectly to determine the final distribution of attack, since corrosion-products, descending from a weak spot in the primary film, screen other portions from oxygen and set up anodic attack over the part screened; also the effect of the cutting stress at the edges is still seen even in an advanced state of corrosion. Thus the factors determining the final distribution of attack are very numerous, but it is impossible to neglect the part played by (a) the state of the primary film, (b) differential aeration and (c) the oxygen-screening caused where secondary corrosion-products settle on the surface; the importance of these three factors is doubtless greater under the conditions of the authors' experiments than under the conditions observed by Dr. Bengough and his colleagues.

Ammonium chloride attacks iron and steel more rapidly than sodium chloride and the distribution is different, the corrosion being commonly most rapid at the water line. The action is probably electrochemical, but there are numerous anodic and cathodic areas close together, the lower cell-resistance explaining the more rapid attack. The fact that the secondary distribution commonly reached in sodium chloride (one large cathodic and one anodic area) is usually not reached in ammonium chloride, appears to be due to the weaker precipitating power of ammonia.

NEW ELECTRIC FURNACES

By E. Fr. Russ

Chief Engineer of Industrie Elektro-ofen, G. m. b. H., Cologne, Germany.

The Russ induction furnace[1] has been successfully applied to large-scale melting of non-ferrous metals at a decided saving in energy as compared with melting in small units. The hearth-type furnaces for aluminum melting consumes 450 kw-hr. per ton of metal. Electric annealing in the induction furnace has been commercially applied to copper and brass strip up to 120 cm. wide and 3 mm. thick. For brass strip the total annealing and pickling consumes 110 kw-hr. per ton.

[1] J. four élec., 40, 176 (1931); Metallwirtschaft, 7, 1150 (1929); U. S. Pat. No. 1,770,662, July 15, 1930.

PLANT PRACTICE FOR NICKEL-PLATING ALUMINUM

By Andrew V. Re

Electroplater, 1904 Newport Avenue, Chicago, Ill.

Satisfactory, thoroughly adherent electrodeposits of nickel on aluminum articles may be obtained by carefully cleaning the surface in an alkaline peroxide bath followed by a strong sulfuric-nitric acid bath, flashing with brass and finishing with a standard nickel bath. The undercoat of brass greatly increases the uniform adhesion of the electroplate to the aluminum surface. Full directions of procedure are given.

MELTING FINE SILVER IN HIGH FREQUENCY INDUCTION FURNACE

By Daniel L. Ogden

Research Director, United States Metals Refining Company, Carteret, N. J.

The Ajax-Northrup high frequency induction furnace has been adapted to the melting of fine silver crystals from the Thum parting cells at the plant of the United States Metals Refining Company at Carteret, N. J. Operating data and the saving in operating costs over the former method of melting are given. The installation of the Ajax-Northrup furnace at the Carteret plant has proved a success, and while the direct saving would not seem to warrant the high cost of installation, the cleanliness, ease of operation and lack of metal loss seem to have warranted the expense.

THE ELECTRIC FURNACE IN THE PATENT OFFICE

By Joseph Rossman

Patent Examiner, U. S. Patent Office.

In order to be able to determine the novelty of any given invention and to facilitate searches in prior patents, nearly 2,000,000 United States patents have been classified into about 300 main classes, each class in turn being subdivided into smaller related subclasses.[1] The Patent Office possesses two sets of these classified patents. One set is used solely by the Examiners in their rooms and the other set is in the Search Room where it may be consulted by the public.

The U. S. Patent Office is constantly revising its patent classification as any given field of invention grows and expands in new directions, or entirely new fields of invention develop, such as the radio, talking pictures, or the electric furnace. No separate class existed in the Patent Office for electric furnaces until 1931 when about 2,000 patents relating to the electric furnace were gathered together and classified into the official class 13—Electric Furnaces. It is the purpose of this paper to present the outline and definition of this class and its subclasses on account of its practical interest and value to those interested in the commercial development of the electric furnace.

[1] A complete list of these classes and subclasses is published in the "Manual of Classification of Patents," Government Printing Office, Washington, D. C., 1929.

STUDIES OF FULLY ORGANIZED ANODIC LAYERS ON ALUMINUM

By J. E. Lilienfeld, L. W. Appleton, W. M. Smith and J. K. Nieh

Respectively, Director of Research, Assistant Director, Research Engineer, and Research Chemist, Ergon Research Laboratories, Malden, Mass.

With the discrimination in view made by other authors between the materially demonstrable and often visible anodic layer and the one acting as the dielectric—the "active" layer—of the electrolytic condenser, experimental evidence is presented indicating that essentially both layers are identical. It is shown, on the one hand, how "pure active layers" can be produced, composed of nothing but the dielectric component, and on the other hand, that the indicated discrimination of the former investigators is due to the inclusion in the "compound layers" used by them of

essentially avoidable, non-dielectric components due to purely accidental features of their formation—features which, with the proper knowledge, may easily be eliminated in the experiment.

A systematic connection of the present work with the organization hypothesis that has been advanced in a previous paper[1] is established. The hydratability of different layers is discussed as one of their basic characteristics and a suggestion of their molecular structure is offered.

The function of capacity versus formation voltage is found to correspond very nearly to a rectangular hyperbolic relation, and this necessarily follows from our conception of the nature and stratified structure of the layer.

Incidentally, the relation between the resistance of the electrolyte and the breakdown voltage is broadly outlined, and also how the breakdown voltage is affected by changing the solvent of the electrolyte. An explanation of these facts is suggested.

ELECTRODEPOSITION OF IRON, COPPER AND NICKEL ALLOYS

Part II. Discussion of Results Obtained from Cyanide Solutions

By Lawrence E. Stout and Charles L. Faust

Associate Professor of Chemistry and Industrial Research Fellow, respectively, Washington University, St. Louis, Missouri.

This paper consists of a theoretical discussion of the physical chemical relations involved in the electrodeposition of iron, nickel and copper alloys from cyanide solutions. It is demonstrated that the cathode process was controlled by the metal and hydrogen overvoltages, both of which depend upon the concentration polarization of the solution as indicated by the rule of mixtures. Numerous experimental indications are cited to show that the depositions occurred from the cyanides in solution buffered with tartrates instead of from the tartrates themselves.

CHROMIUM PLATING OF STEEL FOR WEAR RESISTANCE AT HIGH TEMPERATURES AND HIGH CURRENT DENSITIES

By A. Willink

Frankford Arsenal, Philadelphia, Pa.

To produce a chromium plate which will show a high wear resistance, the bath containing about 250 g./L. CrO_3 and 2.3 g./L. of sulfuric acid is recommended. It should be operated at a current density of 100 to 325 amp./sq. dm., and at 60° to 75° C. Under these conditions it is found that the throwing power is better than at lower temperatures and current densities. The importance of having the steel surfaces clean before plating is emphasized. Alkali cleaners are objectionable on account of the alkaline film which remains and adheres to the steel surface. A "vapor de greaser" is described which employs tri-chlor-ethylene as the solvent. Control of the plating solution by periodic analyses is advocated.

[1] J. E. Lilienfeld, L. W. Appleton and W. M. Smith: High Voltage Anodic Layer on Aluminum, Trans. Am. Electrochem. Soc., 58, 225-274 (1930).

LEAD AND LEAD-ANTIMONY ANODES FOR CHROMIUM PLATING

By E. M. Baker and P. J. Merkus

University of Michigan, Ann Arbor, Mich.

Lead-antimony anodes are frequently used in chromium plating baths. The effects of variation in the percentage of antimony in the alloy at the rate of anode corrosion, and on the oxidation of trivalent to hexavalent chromium were studied. The pure lead anodes were almost resistant to corrosion in continuous plating; the alloys high in antimony were most resistant in intermittent plating. The equilibrium concentrations of trivalent chromium were about the same for all anodes, and were less than 1 gram per liter in 2.5 molar solutions of chromic acid (250 grams per liter).

BERYLLIUM

By Alfred Stock

Professor, Technische Hochschule, Karlsruhe, Germany

The fused electrolyte process on which the large scale manufacture of aluminum and magnesium is based, was not successfully applied to beryllium until very recently. This is due to the very marked affinity of the metal for oxygen and carbon, and to its high melting point (1,300° C.). The author used a mixture of beryllium fluoride and barium fluoride, operating the bath at 1,400° C. Molten Be separates out at the water cooled iron cathode. The extraction of beryllium from beryl is briefly described. For the quantitative estimation of Be in its ores, salts and finished products, a new analytical method was developed based on titration with chinalizarin. The interesting properties and uses of Be are discussed at length. A particularly important field of application are the beryllium bronzes.

Unusual Questions on Plating

Q.—Can you give me any information on the use of alkyl-naphthalene sulfonic acid in electroplating solutions?

How is a soluble molybdate made and used? I refer to such a molybdate as is used in depositing cadmium on non-metallics.

Has anything been done in the electroplating field on coating metals and non-metallic surfaces with carbonyl halogen or carbonyl chlorine compounds of various metals? Could a carbonyl halogen or carbonyl chlorine compound of antimony, gold or silver be made? Which is the most volatile metal when made into a carbonyl halogen compound?

A.—George Lutz and L. R. Westbrook were granted a patent August 11, 1931, covering use of alkyl-naphthalene sulfonic acid in a plating bath. The U. S. Patent number is 1,818,229.

Ammonium molybdate is generally used for coloring work by electrolysis. It is one of the metals that in an aqueous solution deposits on the anode as an oxide. It cannot be deposited in the same manner as cadmium.

Regarding the balance of your inquiry, we might also refer you to United States Patent No. 1,813,900, Aug. 11, 1931; and 1,825,241, Sept. 29, 1931. —G. B. H

Evaluating Lacquer Finishes

By J. A. REINHARDT and E. A. WOELFEL
Western Clock Company, La Salle, Ill.

Some Practical Tests Which Can Be Carried Out by the Foreman Plater Without Special Laboratory Equipment

FROM THE MONTHLY REVIEW OF THE AMERICAN ELECTROPLATERS' SOCIETY, APRIL, 1932

RECENT years have witnessed a phenomenal growth in the use of sprayed organic coatings on manufactured metal articles. In some instances lacquer has supplanted the electrodeposited finish, but in more cases it has been used to supplement the metal plate, in an infinite variety of hues and degrees of luster.

In many plants the decision to make use of organic finishes has meant more, instead of less, work for the plating and finishing department. As the department responsible for the appearance of the product, it more or less naturally occurs that, at first, spray booths are set up in or adjacent to the plating room. The job of training spraymen is given to the plating foreman, who may, or may not, have had any previous experience with spraying materials. The aim of this paper is to present some practical tests which can be carried out by the foreman plater who finds himself confronted with such a task. All can be performed without expensive special laboratory equipment.

When we first began using colors for clocks, the testing laboratory, which has for years maintained a close chemical control of all production plating baths, was expected to provide the same sort of service in respect to lacquers. This task naturally resolved itself into two major divisions:

(1) Maintenance of uninterrupted production; (2) testing of the finished product.

Unlike plating bath control, maintenance of lacquer production is not primarily a chemical problem. The factors which determine a smooth flow of parts through the lacquer room are adequate equipment and satisfactory spraying materials. Our laboratory is concerned chiefly with the latter.

When a new shipment of lacquer is received, a number of panels are finished, using the standard procedure as to number of coats, baking conditions, etc. The approximate time of the initial set is recorded, observations are made as to the hiding and covering power, ease of manipulation, etc. When the panels are dry enough to be handled, they are compared with standard color panels. All test pieces are then allowed to dry for a minimum of 48 hours before further testing.

What Makes a Good Lacquer?

For the purpose of comparing the usability of a number of lacquers, values are assigned to those qualities which are considered fundamental in a good spraying material. We have, naturally, been governed somewhat by conditions met with in our own industry, but with minor alterations to fit specific cases the schedule of values presented herewith is applicable to almost any opaque or pigmented lacquer.

Film-building and hiding power	40%
Drying qualities	25%
Color and lustre	20%
Manipulation	15%

The above applies about equally to a one-coat finish on metal, whether air-dry or baked. Where two or more coats are to be applied, the undercoats should be rated on drying qualities and manipulation, while the finish coat should still be rated as above, except that hiding power can be given a somewhat lower value.

In a one-coat application, the ability of the material to cover and hide small scratches, rough spots, stains and water-evaporation marks is a prime essential. For example, prior to lacquering, drawn brass clock cases are nickel plated to insure clean surfaces and to retard season cracking. In spite of several rinses, ending with hot distilled water, when the cases come from the dryer they always show a water mark on the bottom where the last drop evaporated. To date, about 90% of the various finishes tested have failed to hide these water marks, which fact accounts for the rating of 40% for this property.

Whether the materials under consideration are air-dry or baking, the initial set-up should be as short as possible, in order to prevent the accumulation of dust particles which may imbed themselves in the surface. Generally speaking the time required for the initial set should not exceed five minutes and must be accomplished without "blushing," that is, the precipitation of nitrocellulose by condensation on the film, caused by too rapid evaporation of low-boiling solvents.

Under the head of drying qualities, we must also consider the time which must be allowed before the lacquered parts can be assembled into the finished product. With a baked finish, parts can be handled by the assemblers as soon as they are cool. Many lacquers air dry rapidly enough so that parts may be handled by a careful workman within an hour of spraying, while others may require up to twelve hours drying, before danger of injury to the film is past. By using only lacquers which will dry within this twelve-hour limit, all the work of one day is ready for the assemblers the following morning.

As a measure of drying time, as well as hardness, the print test is of some value. The test consists of applying a standardized pressure, such as one pound per square inch, to a coated panel, with a piece of cloth between the weight and the lacquer film. The cloth may have a coarse, hard fibre, such as canvas, or may be as soft and thin as cheesecloth. The duration of the test should be short, preferably not over a minute or two. If the lacquer has not dried long enough, the pattern of

the weave will be printed in the film at the point of contact.

With respect to color and lustre, each buyer of lacquer must establish some sort of limits to the variation he intends to allow in these qualities. A set of standard panels, showing the ideal, and both extremes in lustre is prepared for each kind of lacquer. These are kept in a cool, dark place to retard change as much as possible, and are brought out for comparison with test panels of newly arrived shipments. Judging of color is more difficult; the best working gauge we have found so far seems to be an experienced eye with a standard color panel. An instrument now on the market, the spectrophotometer, seems to present some possibilities in the problem of determining absolute color values, but as yet none has been available for trial.

As to manipulation, the spray man usually is qualified to furnish information concerning the reduction necessary, any tendency to sag, run or present that undesirable appearance called "orange-peel."

The next series of tests to be described are performed either on the finished articles or on test panels with identical applications of lacquer. Like the others, they have been developed to meet a specific set of conditions, but are capable of considerable variation to fit other and different conditions.

Resistance to perspiration	40%
Flexibility, adhesion and accelerated aging	20%
Moisture resistance in the humidity cabinet	20%
Hardness—Resistance to abrasion	20%

These tests and their values apply equally to single or multi-coat finishes. While a one-coat finish rarely receives as high a rating as one of two or more, due allowance is made for this difference in evaluating the lacquer on test.

The Natural Sweat Test

Early in the history of our work it was made evident that alarm clocks had to withstand a considerable amount of handling. Most of this, naturally, is at the hands of the buyer, who winds it once a day, year after year, often with sweaty hands. Except for a more or less standardized oleic acid test, we were unable to find any definite information on the subject. Experimental work with oleic acid and lard oil mixtures, in varying concentrations, failed to give consistent results. A number of requests for synthetic perspiration formulæ were sent out, and when all the returns were in, we had as many different formulæ as there were replies. The effect of each of these was tried, but to date none has proven as reliable as the test that developed as follows.

In the midst of the search for a satisfactory perspiration test, someone suggested that we try natural sweat. Accordingly, one hot day last summer one of the laboratory force was given a clock case and told to massage it until something happened. In about an hour something did happen. The lacquer film, which was in perfect condition at the start, had deteriorated until it could be scraped away from the metal case like so much soft putty. From this has been developed a test, which, considering the uncontrollable variables it embodies, is surprisingly consistent. When tests are to be conducted, four human "sweat-producers," each with two clock cases sprayed with the lacquer to be tested, are stationed on a platform in the power house, up between the tops of two boilers. The temperature is fairly constant at 135° to 140° F. Each man rubs a clock case for five minutes with hands as wet with perspiration as he can keep them (at 140°, you may be sure he has no difficulty), then passes it on to his neighbor, receiving one in turn. At intervals, each one is tested with a finger nail, to see if the finish can be scratched off, and the rubbing is continued until the coating is reduced to the same puttylike consistency which was noted in the original test. If a lacquer survives two hours of this treatment, it is considered to have passed the test with flying colors. The tests are all run in duplicate, and rarely is there more than five minutes' difference in the time required to break down the two samples. Tests run on the same lacquer on different days and with different "sweaters" still fall within that range of error. Although such a procedure violates nearly all the rules of an exact science, it has, nevertheless, proven to be the only practicable one of many tried, and is being used while the search for a more comfortable substitute goes on.

We have recently been informed that the Bell Telephone laboratories use a variation of this method in testing some of their finishes. Finished panels are set into a specially made leather belt, which is strapped next to the skin on the stomach of the fattest night watchman. The lacquer that survives three weeks of this poisonous contact is adjudged to be satisfactory.

Incidentally, although we have not found the method described to be quite as satisfactory as our own, we are in accord with Shakour and Munchmeyer, whose article on the "Evaluation of Clear Nitrocellulose Metal Lacquers" appeared in "Metals & Alloys" for December, 1931, that "no nitrocellulose lacquer film has yet been found which has outstanding resistance to perspiration, as well as being entirely satisfactory in all other important properties of metal lacquers." The two-hour duration of the sweat test was chosen as the maximum that could be expected if a lacquer were to show satisfactory performance with respect to all other tests.

The Heat-Cold-Humidity Cycle

Like most organic substances, lacquer films are subject to deterioration with age, in which heat, cold, sunlight, air and moisture all play their parts. Brittleness and loss of adhesion are evidences of such deterioration. With the help of a representative of a lacquer manufacturing company, the following methods have been evolved for accelerated aging. A Weather-ometer, such as developed by the Bureau of Standards, would perhaps have served to better purpose, but was not available for our use.

Along with the panels already mentioned, a number of strips of cold rolled steel, 12″ x 2″ x .025″ thick, are also prepared. After 48 hours of drying, they are placed in a constant temperature oven at 145° to 150° F. for 24 hours. From there, with about an hour to cool, they are put in a small electric refrigerator set at 0° F. At the end of 24 hours they are removed and allowed to come to room temperature. A bend is made in one end of the test strip around a piece of ⅜″ rod, and the bent part examined for evidences of cracking or peeling. If the lacquer seems to be in good condition the bend is cut off and the remainder of the strip put through a repetition of the heat-and-cold cycle. This is continued until the lacquer fails. Many of the lacquers fail after completion of the first cycle, while a few have shown no brittleness or lack of adhesion after 21 cycles. As in the case of the perspiration test, maximum flexibility seems to be obtainable only at the expense of some other desirable qualities, so six cycles have been chosen as a minimum. To some extent this test also serves as a measure of the permeability of the film, since moisture always condenses on the surface when the strips are removed from the refrigerator, causing rusty spots to appear wherever the film is porous.

If a refrigerator such as described is not available, it is frequently possible to beg enough space for a few

strips in the cold room of some local ice cream factory, butcher shop or packing plant.

Closely allied in purpose to the heat-and-cold cycle is the humidity cabinet test. A 100-watt lamp in series with a rheostat was placed in an old ice-chest, and the temperature adjusted to about 110° F. In the bottom of the chest were placed two large beakers of distilled water, fitted with wicks to aid evaporation. On a wire rack above the light and water are placed strips and lacquered parts which must show no signs of cracking or softening after two weeks' time. If rust spots appear through the film it is, of course, evidence of porosity.

If so desired, the above two tests may be combined into one heat-cold-humidity cycle, under which conditions the minimum is four cycles instead of six.

These two tests have practically supplanted the salt spray test, since we found that a great many coatings actually seemed to come out of the salt spray in better condition than they were when put in. This was particularly marked in the case of the lacquer that failed so badly on the prespiration test, for after 100 hours of salt spray, it was still apparently in good condition, and subsequently outlasted untreated lacquer in sweat test.

Abrasion Test

In addition to the print test, some attention must be paid to hardness and wearing qualities. In our plant Mr. Danz, the finishing foreman, has a highly educated thumbnail with which he is able to predict the wearing properties of a finish with considerable accuracy. In fact, a good thumbnail scratch often is used to show up a lacquer deficient in hardness or adhesion and so save the time that would otherwise be consumed with further tests.

On a slightly more exact basis, we have an abrasion test, in which we allow a stream of 70-mesh emery to fall against a test panel. The apparatus consists of a glass tube of about six millimeters bore, three feet in length, with a six-inch diameter funnel at the top. The exact spot to be abraded is carefully gauged with a micrometer caliper, and the panel is then placed at an angle of 45°, fourteen inches below the outlet of the 6 mm. tube. The emery falls until the first spot of metal becomes visible through the lacquer, then the panel is removed, the surplus lacquer washed away from the abraded spot and the thickness of the metal is again carefully gauged, the difference between the two readings being the thickness of the lacquer film. The result is generally expressed in weight of emery or minutes of time required to wear through one thousandth of an inch of film. The abrasion test in varying forms is widely used, but this seems to be the simplest form and is sufficiently accurate for most purposes.

Final Rating of a Lacquer

The final rating of a lacquer must be determined by taking both sets of tests into consideration. Forty per cent of this rating depends on the first group of spray-room tests and sixty per cent on the second group of finished product tests. Under this plan, the final standing of the tests is something like this:

Film-building and hiding power	16%
Drying qualities	10%
Color and luster	8%
Manipulation	6%
Resistance to perspiration	24%
Flexibility, adhesion and aging	12%
Humidity cabinet	12%
Hardness—Resistance to abrasion	12%

In our work, we have made it a rule that total failure in any one test automatically eliminates that lacquer from further consideration. The minimum grade required to approve a lacquer is largely a matter of common sense and expediency, since it is obvious that the finish on a dollar clock need not be of the same degree of excellence as that on one that costs five dollars. One fact should be noted, however; the lower the price at which an article must be sold, the greater becomes the importance of the first group of tests in proportion to the second. In using this or any other set of tests for lacquer evaluation, the tester must keep constantly in mind the nature, use and price of the finished article, and rate his tests accordingly.

Finally when two or more lacquers have been found to be satisfactory for the same purpose the deciding factor must of necessity be cost. This is easily determined by spraying a number of similar parts, say 1,000, with each of the lacquers under consideration, and carefully measuring the amounts of lacquer and thinner used. The cost of material per piece can then be calculated. If the decision must be made between a baked and an air-dry finish, the cost of operation of the baking oven and the additional labor must be figured in. Where space is at a premium, this additional cost may frequently be offset by the release of the space occupied by drying racks when an air-dry finish is used.

In conclusion the writers wish to make grateful acknowledgment to E. H. Bucy of the Brevolite Lacquer Company North Chicago, Ill., for his help and advice in establishing and organizing these tests, and to M. C. Danz and F. W. Smith, of our organization, who have been instrumental in carrying them to successful completion.

Newark Branch Meeting — Correction

In the report of the Newark Branch meeting on April 2, our last issue, page 149, paragraph 3, the name of the author of the paper, "The Use of Meta-Silicates," should have been given as Dr. T. K. Cleveland of the Philadelphia Quartz Company, Philadelphia, Pa. Another error also occurred. It states that "Sodium meta-silicate is a general name for a material which varies in composition from $Na_2O.SiO_2.5H_2O$ to $Na_2O.4SiO_2$ water." This is incorrect. It should read: "Sodium silicate is the general name for a material which varies in composition from the metasilicate, $Na_2O.SiO_2$ (or ratio 1:1) to $Na_2O.4SiO_2$ (ratio 1:4)." Sodium metasilicate can only be $Na_2O.SiO_2.XH_2O$ (or $Na_2SiO_3.XH_2O$). There are various hydrates possible and the 5 hydrate is the one which is commonly in use in the metal industry; but the alkali-silica ratio can only be 1:1.

How Shall We Take the Pressure Out of Depression in the Brass Foundry?

By OTTO GERLINE
Gerline Brass Foundry Company, Kalamazoo, Mich.

Knowledge of Costs Is Not Enough Protection Against Stupid Competition and Hard-Boiled Buying, But This Foundryman Is Going to Stand By His Guns and Continue to Fight Fairly.

I READ with interest the article by Charles W. Hardy on Taking the Pressure Out of Depression, in your April issue, and consider it very good. It struck me, at the time of reading this article, that we jobbing brass foundrymen have a story to tell that would be interesting.

In writing this, I will take our own foundry as an example, as we claim to run the largest strictly jobbing brass foundry (doing no finishing whatever) in the state of Michigan, and perhaps in the United States. At least I know of no larger. And our experience may apply to a good many others. Moreover, I have travelled through twenty-two states within the last two years, met and visited a good many brass foundrymen, and conditions were about the same as the prohibition situation, namely, rotten. I believe this is the best word to use. Our business within the last two years has dropped from $150,000 to about $80,000 in 1930; $40,000 in 1931, and God only knows, and he won't tell, what it will be in 1932. The funny part of this is (if funny is the correct word), that we have all of our old customers and some new ones.

Knowing Costs vs. Getting Business

Mr. Hardy says in his article that very few jobbing foundries know their cost or overhead. I agree with him in the main, but in our case, we know, and have an absolutely correct record of our cost of production, overhead, productive and non-productive labor cost, etc. At the present time, however, this does not help us in the least. If we figured our overhead when looking for new work we would never get an order. For example, a man calls us out to his factory and shows us a bunch of blue prints, or patterns, and asks us for a price. We give him a price of, say 20c per lb. The answer will be something like this: "Oh, my God! you're 'way off. We had a man in here from Chicago" (or some other seaport town), "who offered to make these castings for 17c per lb. delivered by truck to our factory. If you can meet this price, I will give you the work in preference to him. We want to keep our work in the city." However, for a quarter to a half-cent per pound, he will send it out of the city. The same man will come into our office later and say, "I am on a Committee, collecting for the City Charity Fund, or the Home for the Friendless, the Orphonage, the Home for Crippled Children, or what have you, and I have you down for $100." He does not ask what we can afford, he simply takes it upon himself to set the price; and that, right after he sent his work out of town.

I was in Jackson, Michigan, the other day to bid on about two tons of castings, bronze, brass, aluminum, etc. I found seventeen other brass foundrymen there, also by invitation. And believe it or not, prices ranged from 14c to 24c on the brass castings; 16c to 26c on bronze or bearing metal, 80-10-10; 18c to 40c on manganese bronze; and lo and behold! 14c to 45c on aluminum castings. The man said to me, "Otto, you are not in it at all, with your figures. We like your work and service very much, but in these times it's a matter of dollars and cents." He then showed me the figures (not showing me the letterheads). I simply said to him, "Charlie, let's have a little drink and I will drive back to Kalamazoo. I am no longer interested." This is not a special example at all, we have them regularly.

We are now working one and two molders, and work anywhere from one to five days per week. We sometimes have to run a heat for a breakdown job, for one or two castings weighing anywhere from one to fifty pounds; mostly less. A customer may want two pieces in manganese bronze, four pieces in bearing metal, and six light pieces, in aluminum. What are we going to do? He is one of our regular customers, has been for years and all we can do is to make these castings at our regular price for his work, and take the loss ourselves; this, or quit business, and no "maybe" about it.

Our taxes amount to about $3.00 per day. Then we have our insurance, our bookkeeper, foreman, night watchman, to say nothing about the president-manager. If some efficiency expert can figure this out for me, I will pay him well. I am saying this with due respect to the experts. They are very good in some places.

Extraordinary Competition

Another condition we have here now is this. The iron foundries put a brass furnace in one corner of their half-empty foundry, hire one of our molders that have been laid off, and make castings, at any price, figuring, of course, no overhead for the brass business at all. The same supervision, taxes, bookkeeping, etc., that takes care of the iron foundry takes care of the brass, without additional cost. Furthermore, we have the molder who is laid off and out of work, who puts a furnace in his garage and goes to it. We also have one here who has a

bench in his basement and makes aluminum castings, melting his aluminum in an old stove and an iron ladle. You will say that these fellows are very small and can't do much, but you forget that they are taking two to five molders away from the bigger fellow. When you have your foundry in the back yard, or in your basement, or in a cheap, rented building, have your wife keep a book for you, and have your children brush up the castings after school, you can make pretty cheap castings. I can't blame these men, and I do not blame them; they must live. I would do the very same thing, if I were up against it. However, all of this does not help us any.

"Greasing" the Buyer

I am happy to say that all of our customers are of the type who appreciate quality of goods and service, and do not require "grease." I could have had several jobs from out of town if I had used the system of buying a bottle or case of booze, and in some way making a present to a purchasing agent. However, we are not educated to this way of getting business, and we are too old to start now. You say it isn't done these days? You have another guess coming and I don't mean maybe.

Whenever we can't get a job on the merits of our work and service, we don't want it. No booze, no airplane rides, no fishing invitations, to get your work. If we have your work and are pleasing you, if our prices are right and you are satisfied, then we can have a little fishing trip together, or even a little drink; but not to get work away from some other fellow.

Earnings—Past and Present

We are not at all ashamed to tell the world that our salary was, in years gone by, $10,000 per year. I believe a good brass foundrymen is worth that, if a movie actor or actress is worth $250,000 for three pictures taken in six or seven months. Of course, this is only my opinion. My salary now is $40 per week; my foreman, $40 per week; and still we are losing money. In 1929 we had a surplus of $17,000. In 1930 we lost, or went into the red, $4,800; in 1931, $2,800, even with our reduced salaries. Under these conditions, we can last a little while longer, and we are going to stick and fight it out along these lines until that surplus is used up. If it becomes necessary to drop from porterhouse steak and mushrooms to cheese and crackers, it will not bother us, as we have done that before. Read of a "Brass Foundryman's Progress" in the METAL INDUSTRY if you don't believe it.

Unintelligent Price Quotations

In conclusion, I will say that the things mentioned above, together with die casting, extruded metal, forged brass, and steel, chrome plated, are hitting the jobbing brass foundries. The metal dealers have a price, and it is very seldom that there is a difference of more than a quarter of a cent a pound on any standard metals. Yet the brass foundry prices range from 14c to 30c for the same product. So help yourself. Some time ago we made a number of eagle radiator caps for automobiles. The two castings weighed 1½ lbs. We made them for 20c per lb. The purchaser told me that his cost for machining and plating was 11c a set. This would be 41c per piece, finished. He sold them to dealers for $1.50, who in turn sold them for $2.50. No worry, no trouble, six months to pay for them. The foundry worries about defective castings, etc., and makes one cent per pound profit. This is not a dream, but a fact.

What in Heaven's name is wrong with us brass foundrymen? It takes years to learn the trade properly. It takes a lot of money to equip a first class foundry. Metal accounts are either cash, 30 days, or pay more for it if you take longer. We have to carry customers 60 to 90 days, sometimes longer, and sometimes the account goes haywire altogether. And yet on a car that sells for $1,000 or more, that has about one hundred pounds of brass and aluminum castings on it altogether, the brass foundryman gets cut down to where he actually must make the castings at no profit, or very little if he wants the order.

This is not a sob story, but the facts as I find them. A firm will spend thousands of dollars for fast working machinery to turn out fast work, but they begrudge the foundry a $40 pattern; and still they expect him to produce castings at the same relative speed and price.

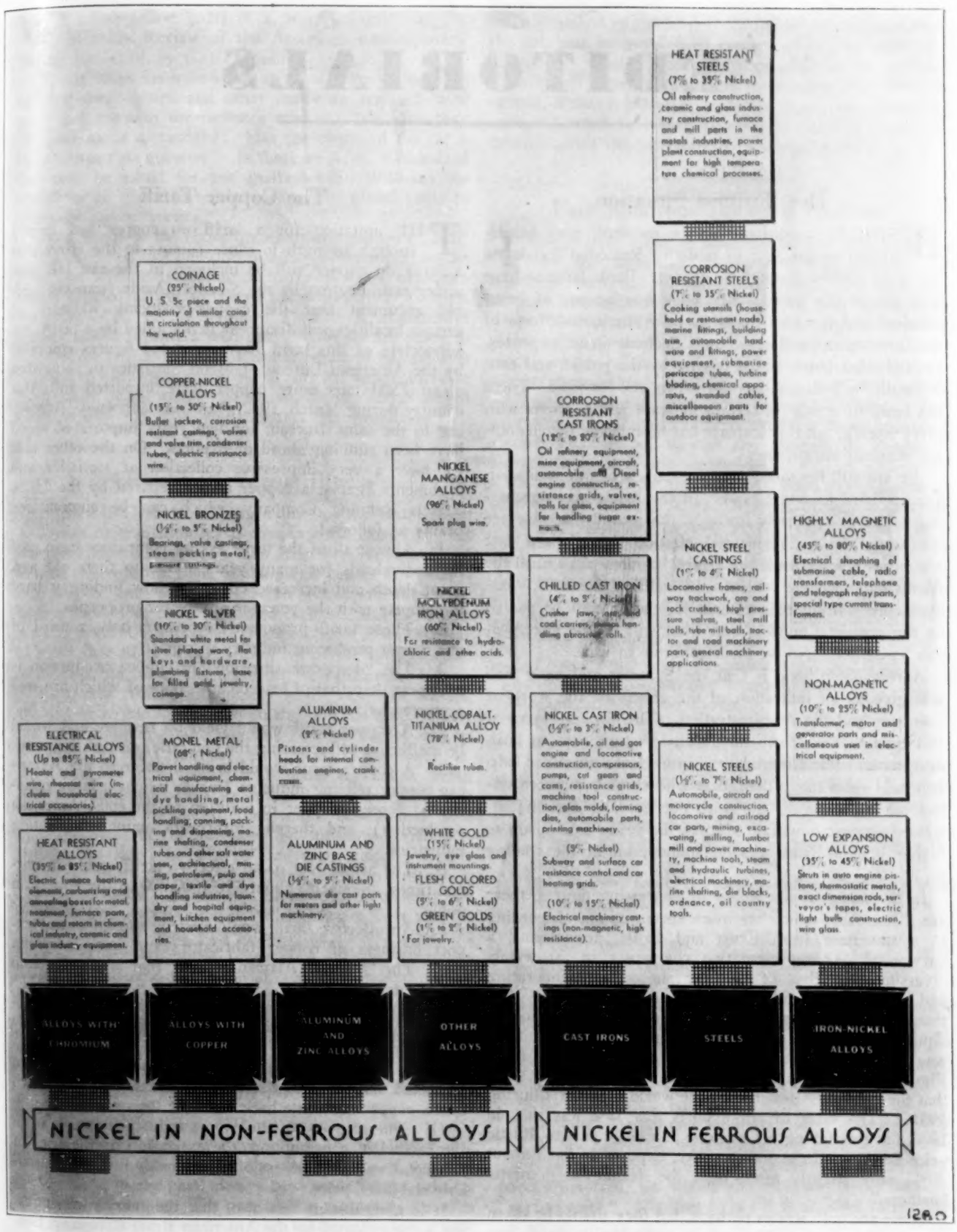
If you are wiling to print this, I will say to my fellow jobbing brass foundrymen, "I sympathize with you, but what are we going to do about it? Write to your Senator for a relief bill for jobbing brass foundrymen. We need it as much as the farmers."

The Use of Nickel in the United States

Some Figures on Consumption of the Metal and its Derivatives, and a Chart Showing How Nickel is Used in Industry

THE CHART on the opposite page gives a very comprehensive view of the various alloy forms in which nickel is being widely used in industry today. This chart is reproduced by courtesy of the International Nickel Company, New York.

Practically all of the nickel used in the United States is imported, the chief source being Canada. The metal is brought into this country in various forms, such as metal, oxide, matte, ore, etc. In 1931 the United States imported 24,164,372 pounds of nickel metal and oxide; and 11,629,709 pounds of ore and matte; the combined value of these imports was $7,637,941. In 1929 the figures ran as high as 67,686,298 pounds of metal and oxide; and 28,981,343 pounds of ore and matte; this had a combined value of $19,064,617. While a good deal of nickel in various forms is exported from the United States, by far the greater part of the imports is consumed in domestic industry.


COINAGE
(25% Nickel)
U. S. 5c piece and the majority of similar coins in circulation throughout the world.
COPPER-NICKEL ALLOYS
(15% to 30% Nickel)
Bullet jackets, corrosion resistant castings, valves and valve trim, condenser tubes, electric resistance wire.
NICKEL BRONZES
(½% to 5% Nickel)
Bearings, valve castings, steam packing metal, pressure castings.
NICKEL SILVER
(10% to 30% Nickel)
Standard white metal for silver plated ware, flat keys and hardware, plumbing fixtures, base for filled gold, jewelry, coinage.
ELECTRICAL RESISTANCE ALLOYS
(Up to 85% Nickel)
Heater and pyrometer wire, rheostat wire (includes household electrical accessories).
MONEL METAL
(68% Nickel)
Power handling and electrical equipment, chemical manufacturing and dye handling, metal pickling equipment, food handling, canning, packing and dispensing, marine shafting, condenser tubes and other salt water uses, architectural, mining, petroleum, pulp and paper, textile and dye handling industries, laundry and hospital equipment, kitchen equipment and household accessories.
HEAT RESISTANT ALLOYS
(35% to 85% Nickel)
Electric furnace heating elements, carburizing and annealing boxes for metal, roasters, furnace parts, tubes and retorts in chemical industry, ceramic and glass industry equipment.
ALUMINUM ALLOYS
(9% Nickel)
Pistons and cylinder heads for internal combustion engines, crankcases.
ALUMINUM AND ZINC BASE DIE CASTINGS
(½% to 5% Nickel)
Numerous die cast parts for motors and other light machinery.
NICKEL MANGANESE ALLOYS
(96% Nickel)
Spark plug wire.
NICKEL MOLYBDENUM IRON ALLOYS
(60% Nickel)
For resistance to hydrochloric and other acids.
NICKEL-COBALT-TITANIUM ALLOY
(78% Nickel)
Rectifier tubes.
WHITE GOLD
(15% Nickel)
Jewelry, eye glass and instrument mountings.
FLESH COLORED GOLDS
(5% to 6% Nickel)
GREEN GOLDS
(1% to 2% Nickel)
For jewelry.
CORROSION RESISTANT CAST IRONS
(12% to 30% Nickel)
Oil refinery equipment, mine equipment, aircraft, automobile and Diesel engine construction, resistance grids, valves, rolls for glass, equipment for handling sugar extracts.
CHILLED CAST IRON
(4% to 5% Nickel)
Crusher jaws, grate and coal carriers, pumps handling abrasives, rolls.
NICKEL CAST IRON
(½% to 3% Nickel)
Automobile, oil and gas engine and locomotive construction, compressors, pumps, cut gears and cams, resistance grids, machine tool construction, glass molds, forming dies, automobile parts, printing machinery.
(9% Nickel)
Subway and surface car resistance control and car heating grids.
(10% to 15% Nickel)
Electrical machinery castings (non-magnetic, high resistance).
HEAT RESISTANT STEELS
(7% to 35% Nickel)
Oil refinery construction, ceramic and glass industry construction, furnace and mill parts in the metals industries, power plant construction, equipment for high temperature chemical processes.
CORROSION RESISTANT STEELS
(7% to 35% Nickel)
Cooking utensils (household or restaurant trade), marine fittings, building trim, automobile hardware and fittings, power equipment, submarine periscope tubes, turbine blading, chemical apparatus, stranded cables, miscellaneous parts for outdoor equipment.
NICKEL STEEL CASTINGS
(1% to 4% Nickel)
Locomotive frames, railway trackwork, ore and rock crushers, high pressure valves, steel mill rolls, tube mill balls, tractor and road machinery parts, general machinery applications.
NICKEL STEELS
(½% to 7% Nickel)
Automobile, aircraft and motorcycle construction, locomotive and railroad car parts, mining, excavating, milling, lumber mill and power machinery, machine tools, steam and hydraulic turbines, electrical machinery, marine shafting, die blocks, ordnance, oil country tools.
HIGHLY MAGNETIC ALLOYS
(45% to 80% Nickel)
Electrical sheathing of submarine cable, radio transformers, telephone and telegraph relay parts, special type current transformers.
NON-MAGNETIC ALLOYS
(10% to 25% Nickel)
Transformer, motor and generator parts and miscellaneous uses in electrical equipment.
LOW EXPANSION ALLOYS
(35% to 45% Nickel)
Struts in auto engine pistons, thermostatic metals, exact dimension rods, surveyor's tapes, electric light bulb construction, wire glass.
ALLOYS WITH CHROMIUM
ALLOYS WITH COPPER
ALUMINUM AND ZINC ALLOYS
OTHER ALLOYS
CAST IRONS
STEELS
IRON-NICKEL ALLOYS
NICKEL IN NON-FERROUS ALLOYS
NICKEL IN FERROUS ALLOYS
1280

See opposite page for additional information on nickel.

Editorial Contents and particulars on advertising page 4; Buyers' Guide on advertising page 47 (after text pages).

EDITORIALS

The Business Situation

BUSINESS conditions, at the moment, may be described as hanging in mid-air. Remedial legislation has been pushed through Congress. Bank failures have been almost eliminated. The budget is by way of being balanced and it seems that the really strenuous efforts of the Government will result in a decrease in its expenses. On the other hand, actual buying by the public, and consequently by industry, has not yet moved forward. There has been, of course, a certain increase which comes with every Spring, but this increase has been below the customary seasonal improvement.

We are still hesitating, but the causes of our hesitation are not hard to understand. In the first place, purchasing power is extremely low. In the second place we are confronted by a Presidential election this Fall, a fact which has always tended to retard business plans until the results have become evident. In addition, business is undoubtedly waiting to see what legislation will be passed by the present Congress and what will be the effects of this legislation. So we must continue to wait.

A reasonable hope is that the Summer and early Fall will give us an indication of the effects of the work of Congress and the Administration. The election seems at this time to hold forth no unusual disturbances to business, as no radical candidate is in evidence on either side. It would seem likely then, that with these two uncertainties out of the way, and with our banking system buttressed against downfall, we may be ready to step up to higher ground from a solid foundation, in the coming year.

In the midst of the welter of depressing figures, there are a few facts which are more encouraging. According to a statement from Ernst and Ernst, accountants, a survey of 432 representative companies in 20 widely diversified branches of industry shows better operating and net profits in relation to capital investment in 1931 than in 1921, (also a year of deep depression). Also, the liquid position of a group of 468 industrial corporations was more than twice as strong as at the close of 1921. Figures released by the Department of Commerce show that the United States still led the world in exports during 1931. "The value of our exports was 37% less than in 1930, but this falling off was due in a large part to drastic price declines. In actual quantity, exports declined about 20%, only slightly more than the decline in domestic business."

These are only straws perhaps, but they should be taken into consideration. Times are undoubtedly hard, but there seems to be a growing feeling that 1932 will see the worst of them, over.

The Copper Tariff

THE agitation for a tariff on copper has gained enough strength to cause rumors to the effect that a tariff on copper will be included in the tax bill now under consideration by the Senate. Aside from the age-old argument that the copper-producing industry in certain localities will disappear if not aided by a tariff, the supporters of this tariff have presented figures compiled by the American Bureau of Metal Statistics to show that about 7500 tons more copper were imported into this country during March, 1932, than were exported. According to the same Bureau, for two years imports of metal have been running ahead of exports. On the other side we have a very impressive collection of statistics and arguments against a copper tariff prepared by the U. S. Metals Refining Company, which can be summarized briefly as follows:

1. Almost all of the tariff asking companies have paid huge dividends for many years. Due to their old age, great depth and increased costs, are now finding it hard to compete with the younger and better properties.
2. These tariff proponents represent only a third of our copper-producing industry in capacity.
3. The "desperate situation" in copper production is no worse than that of lead or zinc, both of which are well protected by tariffs.
4. A copper tariff would yield no revenue and would be ineffective in increasing the domestic price of the metal.
5. A copper tariff would bring disaster to the American copper refining industry (which refines a large quantity of foreign copper in addition to the total American production), and thereby injure its many contributing industries.
6. The actual cost of an effective tariff would in normal times, amount to about $100,000,000 to the American public.
7. An effective tariff would destroy the important export business of copper fabricators and manufacturers.
8. The "flood of African copper" that is pouring into the country is a myth.
9. The Tariff Commission reports an excess of domestic cost over the foreign cost of refined copper of only ½ cent per pound.
10. The "utter ruin of the copper industry" has been predicted six times in the past 45 years, but after each crisis, copper has come back stronger than ever.
11. The recovery of the copper industry depends upon the revival of consumption, the expansion of the uses of the metal, and assuredness of a reasonably low and reasonably stabilized price.

It is a significant fact also, that the fabricating industry, as represented by the American Brass Company, Scovill Manufacturing Company and the Chase Companies are opposed to a duty on copper.

Standardization in Electroplating

WE quote below, parts of a paper published in The Monthly Review of the American Electroplaters' Society for April, by C. E. Clindinin.

"If one takes his automobile to a job shop to have the radiator shell, lamps and other hardware replated, how many are there in the industry who can tell what they will give us as a standard? Has the owner of the car a right to ask that question? Is there an A. E. S. standard that may be asked for and guaranteed? Will any instructions be given as to the care of the plated parts to obtain maximum service?"

The answers to the above questions are generally "No."

We have just one question to add. What would be the effect on the electroplating industry if most manufacturers decided to put on every piece of plated products, the mark—"A. E. S. Standard Plate." A quantitative answer would be only a wild guess. But we are ready to venture the prediction that it would result in the greatest impetus to electroplating in its history; it would increase the respect of the public for electroplating, and it would increase the respect of electroplaters for themselves.

Cleanliness Versus Illness

A STRIKING fact brought out by the statistics of lost time in industry is that sickness causes at least ten times more absenteeism than accidents. It so happens that in electroplating, one of the major causes of illness is skin trouble, such as the nickel itch or cyanide sores. We have a number of times published remedies and the simple medical preventives for these troubles, but it is well to bear in mind that there is one preventive of the simplest kind which should never be neglected—**cleanliness.**

Most skin trouble in industry is the result of leaving the dirt or irritating material on the skin too long. Ninety per cent of plating skin troubles (except burns) can be prevented by rigid personal cleanliness. If the plater, before work in the morning, will scrub his hands, arms, face and neck with soap and warm water, using his own personal scrubbing brush, then apply lanolin and olive oil in equal parts (or any other oily mixture softened to use on the skin) he will be safe from attack. Before lunch, scrub up again. After lunch scrub up and rub in the grease again. At the end of the day scrub up again (the whole body this time if the clothes are dirty and the oil or dust has been rubbed into the hands, arms and neck). There are minor precautions such as wearing a sweat band around the forehead, keeping hands, arms and sleeves away from the face, etc., but they can all be covered by the one fundamental rule: the best preventive of skin trouble in the shop is personal cleanliness.

Powdered Metals

IN this issue, on page 179, we print our first extended description of a new development in metallurgy—the use of metallic powders for the manufacture of products which have, in the past, always been made by the fabrication of solid metals. The outstanding feature of "powder metallurgy" is the absence of high temperature operations. There is no melting. The metallic powders are used pure or mixed in any proportions desired, subjected to very high pressures in dies, sintered under comparatively low temperatures, and are then practically ready for use.

This method of fabrication is so radically different from the old, that its possibilities cannot, as yet, be accurately estimated. That it has great possibilities is obvious. That it will have limitations is to be expected. What is certain, is that it behooves everyone, in any way connected with the metal industries, to keep in touch as closely as possible, with the progress of powdered metals.

Fair Relations Between Partners

THE modern trend in handling people, now dignified by the name of "Personnel Management" or relations between employer and employee, has undergone marked changes during the past generation. Twenty-five or thirty years ago, a few large progressive plants began to think of the need for enlisting from their employees, more than merely their time and physical effort. They wanted in addition, their good-will, which, in many instances, was conspicuously lacking. Just as methods and manufactured products have improved, during this period, so has the attitude of employers toward their men, and vice versa.

In a paper before the National Founders Association at their last meeting, A. D. Lynch showed how carrying such a program into effect places responsibilities upon the shoulders of the management and the foreman. To be sure, the foreman is required to keep his men up to their best operating pitch. But in order to do so he has to be supplied with certain tools and the backing of his employers, who are required to supply:

1. Proper working conditions.
2. Proper equipment, machinery, tools, materials.
3. Proper wages, equably administered.
4. Continuity of employment.
5. Opportunity for advancement.
6. Proper leadership.

The foreman is required to interpret management policies, purposes and needs for the workers. He must not only make these needs clear to them but he must set the proper example by providing:

1. Proper working conditions (a clean and orderly department).
2. Machinery, tools, equipment and materials in good working order.
3. Fair treatment.
4. Proper instructions.
5. Proper supervision.
6. Fair wage rates.

The worker, in turn, who is offered the above conditions also has responsibilities. He must:

1. Be clean and orderly.
2. Be careful (take good care of property, equipment and material).
3. Be dependable, punctual and industrious.
4. Follow instructions willingly and continuously.
5. Work agreeably with others.

Given the above requirements carried out in full by all parties involved, we would almost immediately have the "perfect state." Needless to say it is an ideal rather than an accomplished fact. But we cannot have accomplishments without ideals. We commend this practice to employers and employees alike.

Correspondence and Discussion

Metal Industry Invites Correspondence on Subjects of Interest to Its Readers.

Pink Gold

Editor, METAL INDUSTRY:

In regards to Pink Gold on eye glass frames, we had occasion a few days ago to see a pair of pink gold glasses. The frame was gold filled with the outer layer pink gold alloy, not plated on. The alloy can be produced in several ways. A 14K alloy may be composed of gold 58.3%, copper 37.5%, cobalt 4.2%. If the color is too light, add small amounts of pure iron. A pinkish-red alloy, 14K, consists of gold 58.3%, silver 10%, pure copper 31.7%. A pink-orange color alloy, 16K, is made of gold 66.7%, silver 8.3%, pure copper 25%. A rose-pink alloy, 18K: gold 75%, silver 2.5%, pure copper, 22.5%.

PLATINUM-CHROMIUM COMPANY, INC.

Chicago, Ill.

Pink Gold Plate

Editor, METAL INDUSTRY:

In the March issue of your paper, page 119, an inquiry in regards to Pink Gold Plate remains unanswered. This finish may be produced as follows:

Dissolve exactly ⅛ ounce of C. P. sodium cyanide in one quart of cold water. In another quart of cold water dissolve, one at a time, 1 ounce yellow prussiate of potassium, ¼ ounce sodium gold cyanide, 1 ounce crystal sodium carbonate. Mix the solutions and divide into two equal parts. Use pure gold anodes for both solutions. The article is placed in one solution at a temperature of about 120° F., or higher, for not to exceed 2 seconds at a time, and then at once transfer to the other, adjoining solution which should be heated to about 200° F., or higher, for the same length of time. The alternate baths produce a light blue and a light red plate, which, after 20 seconds or more plating becomes a pink gold. The scum is relieved with moist bi-carbonate of soda.

LINICK, GREEN AND REED, INC.

Chicago, Ill.

No Kocour Agent Named Gross

Editor, METAL INDUSTRY:

We have recently received a letter from a prospective customer in which they state a man giving his name as Gross of New York City has claimed to represent us and has collected money in advance for testing instruments.

We would consider it a favor if you could notify your readers in some way that this man does not represent us.

KOCOUR COMPANY,
(By) C. Kocour.

Chicago, Ill.

New Books

Psychology At Work. Edited by Paul S. Achilles. Published by Whittlesey House, New York. Size 5½ x 9, 260 pages. Price $2.50.

Psychology at Work describes the most recent methods and practical findings of present day psychology. It is written by seven specialists, recognized authorities in their respective field. It presents in clear, non-technical language the applications of psychology to industry and other different branches of human activity.

Each chapter is devoted to a different field, the book as a whole covering the applications of psychology to education, personality, medicine, law, industry, social and political problems.

The Book of Metals. By Donald Wilhelm. Published by Harper and Brothers, New York. Size 6 x 9; 341 pages. Price $4.00.

This book tells simply the "stories" of all the metals—their history, mining, alloying and the extraordinary increase in their number and uses. It is not a technical book, but it has combed the substance of technical material to present to the reader in simple language the material unearthed and piled up by scientists for decades. The various stories have been carefully checked for scientific accuracy by more than 35 metallurgists.

The metals and alloys described are iron, steel, aluminum, copper, brass, bronze, nickel, zinc, lead, tin, gold, silver and platinum and its family.

Symposium on Welding. Published by the American Society for Testing Materials. Size 6 x 9; 151 pages. Price $1.75.

This book comprises the papers which were presented in a Symposium on Welding held at the second regional meeting of the Society in Pittsburgh, Pa., March 1931. The book includes the 11 papers given in the Symposium and the discussions which followed. Special attention is paid to the characteristics of the newer welding processes. Processes and uses are classified from the functional standpoint. The various methods of gas and electric arc welding for aluminum are discussed, involving the types of joints used, alloys welded and merits of the methods.

The book discusses all types of welding and also methods of testing welds such as by magnetic inspection, X-ray equipment, fatigue testing, etc.

The Advanced Technique of Porcelain Enameling. By J. E. Hansen. Published by the Enamelist Publishing Company, Cleveland, Ohio. Size 5½ x 8½; 309 pages. Price $3.50.

This is a new, improved and enlarged edition of the text book published by and edited under the Ferro Enamel Corporation of Cleveland, Ohio. The book has been used as a text in a semi-annual "School for Enamelers," held in Cleveland during the past few years.

It is essentially practical in character describing the works operations from the selection and fabrication of the base metal to the finished product with decorative effects. A second part of the book has been included, on management methods such as controls, wage incentives, accounting, etc.

Shop Problems

This Department Will Answer Questions Relating to Shop Practice.

ASSOCIATE EDITORS

Metallurgical, Foundry, Rolling Mill, Mechanical

H. M. ST. JOHN — W. J. PETTIS
W. J. REARDON — P. W. BLAIR

Electroplating, Polishing, and Metal Finishing

O. J. SIZELOVE — A. K. GRAHAM, Ph.D.
G. B. HOGABOOM — WALTER FRAINE

Aluminum Pressure Castings

Q.—We recently received a request for a quotation on aluminum castings that must hold 300 pounds pressure. We would appreciate it if you would furnish us with the formula for an alloy to meet these specifications. The castings are nipples. Do you think an alloy of silicon 5%, aluminum 95%, will give satisfactory results?

A.—We suggest you use S.A.E. specification No. 32, which is given as follows:

Aluminum, minimum	85.50
Copper	11.00 to 13.50
Zinc, maximum	0.20

Silicon, iron, zinc, manganese and tin, maximum 1.70.
Keep to the high side of the copper.

The tensile strength of test specimens about ½ inch in diameter of this alloy, cast in sand, and tested without machining off the skin, is about 19,000 to 23,000 pounds per square inch. The elongation is practically nil. The specific gravity is about 2.95. This alloy was designed for manifolds, pumps, carburetors, cylinders and other parts which stand water pressure.

We are afraid 95% aluminum, 5% silicon would not answer your purpose. The design of the nipple will have to be taken into consideration to stand 300 pounds pressure.

W. J. R., Problem 5,090.

Cheap Heat-Resistant Plate

Q.—I have a large number of iron castings that I have been cadmium plating, and everything has worked out perfectly but for the fact that some of these castings are used as a heating unit, and there seems to be a tendency on the part of these particular pieces to stain a very undesirable yellow.

The stain, of course, comes from an excess of heat but there is no getting away from that. The discoloration begins at a temperature of about 550° F., and is not noticeable at 450° to 470°, the usual working range. The maximum of heat is reached at 650° F.

The cadmium was intended as a rustproof coating as well as to get away from the trouble of the original paint finished surface, which caused a lot of trouble by peeling and blistering when heated.

Is there any way that this staining can be eliminated by treating the plated articles after they are plated, before using them? If not, is there anything similar to cadmium in color and rustproof qualities that can be applied to these castings that will be as low in cost as cadmium?

A.—We know of no material that may be applied to the cadmium deposit that will withstand a temperature of 650° F. without peeling or blistering. We might suggest the use of cellulose acetate or a solution of sodium silicate. The cellulose acetate is obtainable from lacquer manufacturers, the sodium silicate from chemical dealers. The sodium silicate should be diluted with water to 20° Beaumé, before using.

There is no other plated finish as cheap as cadmium for your

USE THIS BLANK FOR SOLUTION ANALYSIS INFORMATION

Fill in all blanks if possible.

Date .....

Name and address: .....**Employed by:** .....

Kind of solution: .....**Volume used:** .....

Tank length: .....**width:** .....**Solution depth:** .....

Anode surface, sq. ft.: .....**Cathode surface, sq. ft.:** .....

Distance between anode and cathode: .....**Kind of anodes:** .....

Class of work being plated: .....**Original formula of solution:** .....

REMARKS: Describe trouble completely. Give cleaning methods employed. Send small sample of work showing defect if possible. Use separate sheet if necessary.

NOTE: Before taking sample of solution, bring it to proper operating level with water; stir thoroughly; take sample in 2 or 3 oz. clean bottle; label bottle with name of solution and name of sender. PACK IT PROPERLY and mail to METAL INDUSTRY, 116 John Street, New York City.

class of work, but we would suggest that you experiment with tin plating for a possible finish. Another suggestion is zinc plating.

O. J. S., Problem 5,091.

Dark Green Gold Plate

Q.—I enclose a sample of some dark green gold plated work which I would like to reproduce. Can you tell me how this is done?

A.—Dark or antique green gold solutions are produced by adding lead to a light green gold solution. To make the lead salt dissolve 1 oz. lead carbonate with 4 oz. caustic soda in a pint of water.

Formula for gold solution:

Gold cyanide	½ oz.
Silver cyanide	¼ dwt.
Sodium cyanide	6 oz.
Water	1 gallon

Temperature, 105° F.; 4 to 6 volts. Use 18 karat green gold anodes.

In adding the lead salt to the gold solution, add a very small quantity at a time until the dark smut is produced. Agitation of the work helps to produce the smut. Relieve the highlights with a soft goat or fitch hair wheel, using bicarbonate of soda moistened with water.

O. J. S., Problem 5,092.

Ferrules By Deposition

Q.—We are looking forward to making small tapered ferrules by electrolysis. We make these now by drawing a tube, but we cannot compete with low-priced foreign products.

We have no copper plating tank as yet to make a copper shell on a mandrel, but are experimenting in a nickel tank. If we can put a shell of nickel on a mandrel we figure we can put on a shell of copper and slip it off.

We have tried waxes and graphites and bronzing powders and otherwise, but with no success. If the salts won't work possibly you know of something that will.

A.—While it is possible to make a tapered ferrule such as sample submitted by electrolysis, the cost in doing so would be considerably greater than making them by the drawing process.

If they can be imported at a cost that is less than you can produce them for, we would suggest that you have them made by one of the large brass and copper companies, who we feel sure will be able to produce them at a very low cost.

If you wish to produce them electrolytically in an acid copper solution, the mandrel should be made of lead or copper. If made of lead, the sulphur method should be used to produce a sulphide to prevent permanent adhesion of the deposit. If copper is used a 3% solution of potassium iodide should be used.

With either method you will not be able to remove the deposit without a light rolling or swedging operation.

O. J. S., Problem 5,093.

Small Generators

Q.—We are using a storage battery for gold and silver plating small emergency jobs such as keys and rings of saxophones and clarinets. I find it very hard to match or shade my gold on these small jobs to blend with the original instrument body color. I believe this is caused by uneven current supply.

Would a small automobile generator of the common type, driven by an electric motor be suitable for our purposes? The load is very small, usually two to six keys having very small surface.

If you know of any experiences with these small generators, we will appreciate any information you can give us.

A.—It is possible to use a generator of the automobile type to do electroplating on a small scale. These generators usually produce from 6 to 8 amperes, which would be sufficient for your class of work. However, the battery should do your work, and we are inclined to believe that your trouble is with the regulation of the current rather than with the amount that is generated. With a rheostat in the circuit to control the current you should have no trouble.

O. J. S., Problem 5,094.

Purifying Copper

Q.—Could you inform us as to the best flux or deoxidizer to use with crucible-cast copper for producing perfectly sound copper suitable, when rolled, for engraving plates, etc.?

A.—Deoxidizing materials such as silicon, magnetism or phosphorus answer most ordinary purposes. A non-metallic flux is best if pure copper is to be produced. Cyanide of potash fulfills this condition, and if the copper is melted under such a flux pure metal will result.

The cyanide is the most powerful reducing flux known, and reduces oxide of copper without introducing anything into the copper. Its cost, however, is too great for ordinary work. For greater economy we suggest using 3 ounces of 15% phosphor copper to each hundred pounds of copper melted. Smoke the iron mold with acetylene gas smoke before pouring.

No deoxidizer will restore overheated, burnt copper, as gases are absorbed from the fire which are expelled while the metal is cooling. It is not oxide of copper formed in melting but the gases which are absorbed that cause difficulty.

In melting copper it should at all times be kept well covered with charcoal. A handful of common salt should be thrown in just when the metal begins to melt. This will serve to purify the metal.

The most important rule in melting copper is to avoid overheating or soaking. As soon as the temperature for pouring is reached the deoxidizing agent should be introduced, the metal stirred and allowed to stand a minute or two in order to allow the deoxidizing agent to thoroughly penetrate the metal. The pouring should then take place. It is often not so much the deoxidizer you use as how you use it that is important.

W. J. R., Problem 5,095.

Hard Gold Deposits

Q.—I have tried using a pure nickel anode in a gold plating solution to produce a hard deposit, but have not been very successful.

The anode took on gold by immersion, and as far as I could see no nickel went on the work. The work came out the same as though a gold or carbon anode had been used. The nickel anode look unchanged.

Is the nickel anode method generally used for this purpose? Did I go wrong somewhere in using it?

A.—Nickel may be deposited with gold as an alloy in a cyanide solution, and it may be introduced into the solution either by adding a nickel salt to the gold solution or by the use of a nickel anode.

The anode will corrode very slowly, so in getting the solution started it is usually customary to add a nickel salt, preferably nickel cyanide.

All gold deposits that contain any nickel will be light in color, so it is the practise to plate the work in a gold solution that contains the nickel and finish in a fine gold solution to get the color.

There is a commercial process for hardening fine gold. We can supply the name of the firm controlling the process if you request it.

O. J. S., Problem 5,096.

Green Brass Finish

Q.—Can you give me a dip that will give brass or gilding metal a green color?

A.—Formula for green verde finish:

Copper nitrate	1 lb.
Ammonium chloride	4 oz.
Acetic acid	1 qt.
Water	1 gallon

The work must be clean and then dipped into the verde solution. It is hung up to dry, and if the verde color is not heavy enough repeat the operations.

Instead of dipping the work the second time a little of the solution may be applied with a painter's sash brush to even the finish by stippling.

O. J. S., Problem 5,097.

Patents

A Review of Current Patents of Interest

Printed copies of patents can be obtained for 10 cents each from the Commissioner of Patents, Washington, D. C.

1,842,028. January 19, 1932. **Method of Recovering Lead-Tin Alloys.** Edward Frank Kern, New York, N. Y., assignor to American Metal Company, Limited, New York, N. Y.

The method of recovering lead-tin alloys which comprises electrolyzing anodes consisting of impure alloys of lead and tin in a bath containing from 50 to 125 grams of soluble salts of lead and tin and from 30 to 80 grams of free acid per liter of electrolyte.

1,842,099. January 19, 1932. **Portable Apparatus for Removing Surface Coatings.** Le Baron B. Johnson, New York, N. Y., assignor to Oakite Products, Inc., New York, N. Y.

In an apparatus for stripping paint and finish coatings from inclined and upright surfaces, a heater, means for circulating paint removing solution through said heater thereby to highly heat the same, and means for conducting heated paint-removing solution from said heater and for uniformly distributing the same to the surface being stripped along a horizontal line extending across the upper part of a substantial portion of the surface being stripped, thereby to produce a uniform downward flow of paint-removing solution in the form of a continuous sheet over a substantial portion of the surface being stripped.

1,842,409. January 19, 1932. **Dust Collecting System.** Sylvester W. Kirk, Richard J. Blum and William Roger Meuttman, Cincinnati, Ohio, assignors to The Kirk & Blum Manufacturing Company, Cincinnati, Ohio, a corporatilon of Ohio.

In a dust collecting system of the class described the combination of a continuous casing from which air is exhausted at a low rate, branch pipes extending from the casing whereby waste material from various sources is carried into said continuous casing, a series of hoppers having discharge ports, the series of hoppers serving to form the bottom of the continuous casing, a conveyor pipe from which air is exhausted at a high rate, said conveyor pipe having constant communication with the discharge ports of the hoppers and means for exhausting air from the conveyor pipe.

1,842,541. January 19, 1932. **Method of and Means for the Prevention of Corrosion.** Elliott Cumberland, Kingston Hill, England.

The method of preventing the destruction of metallic objects in contact with an electrolyte by electrolytic decomposition by electric currents from a current source comprising connecting the negative side of said current source to the object to be protected, providing an electrode adjacent the object to be protected and connecting the electrode to the positive side of said current source.

1,843,842. February 2, 1932. **Method and Device for Producing Metallic Coatings and Particularly Lead Coatings.** Max Ulrich Schoop, Hongg, near Zurich, Switzerland.

A device for heating a compressed gas and having an inner core, means producing a flame impinging on outer cover, means to supply gas to the intermediate space between said inner core and said cover, a nozzle head at the outer end of said core for discharging said gas for atomizing purposes, and means to feed the coating metal through said heating device in which it is melted by said heated gas, atomized and projected against the surface to be coated.

1,844,287. February 9, 1932. **Solder.** Henry Edward Kehder, Huey, Ill., assignor of one-half to Edward Mat Pelzer, St. Louis, Mo.

A solder composed of 67% by weight of bar tin, 4.2% by weight of nigrosin, 4.2% by weight of yellow dextrin, 8.7% by weight of extract of log wood and 15.9% by weight of soldering paste.

1,844,466. February 9, 1932. **Turnover for Molding Machines.** William J. Fiegel, Detroit, Mich., assignor to Bohn Aluminum & Brass Corporation, Detroit, Mich.

In a molding machine, the combination with a reciprocable ram, of a squeezer plate arranged above the ram and cooperating therewith to compress a mold, a swinging frame supporting said squeezer plate, and means carried by said ram for engaging said frame to prevent undesired movement of the latter relative to the ram.

1,844,556. February 9, 1932. **Electroplating Apparatus.** Walter Birett, Berlin-Charlottenburg, Germany, assignor to United Chromium, Incorporated, New York, N. Y.

An anode for use in electrodeposition from highly oxidizing solutions and particularly chromium plating solutions of the chromic-acid sulphate radical type, comprising active and inactive portions normally in contact with the electrolytic solution, said inactive portions comprising aluminum having on its surface an oxidized coating of aluminum forming a stop, whereby the current is inhibited from flowing from the aforesaid inactive portions, the current flow being confined to the active portions of the anode.

1,844,751. February 9, 1932. **Process of Electrodepositing Chromium.** Colin G. Fink, New York, and Hugh David McLeese, Brooklyn, N. Y., assignors, by mesne assignments, to United Chromium, Incorporated, New York, N. Y.

A process of electroplating chromium comprising passing an electric current through a solution containing chromic acid and a soluble fluorine-containing compound, said compound being fluosilicic acid, the amount of fluosilicic acid being that amount which contains the same amount of fluorine as that contained in 10 grams per liter or less of CrF_3 for a solution containing 250 grams per liter CrO_3, and a proportionately higher or lower fluosilicic acid content for a higher or lower CrO_3 content.

1,844,937. February 16, 1932. **Process of Electrolytic Copper Refining.** Noak Victor Hybinette, Wilmington, Del.

The method of recovering nickel from electrolytic solutions containing nickel, copper and free sulfuric acid which comprises separating the copper by electrolysis, then increasing the sulphuric acid concentration until the total free acid is about 200-300 grams per liter, and cooling to about —10° to —20° C., and thereby separating nickel sulphate crystals.

1,844,969. February 16, 1932. **Welding Flux.** Joseph W. Meadowcroft, Philadelphia, Pa., assignor to Edward G. Budd Manufacturing Company, Philadelphia, Pa.

A composition of matter suitable for the coating of welding rods used in the autogenous welding of aluminum and the like.

1,844,983. February 16, 1932. **Lacquer for Coatings on Metal Surfaces.** Hermann Schladebach, Dessau in Anhalt, and Herbert Hähle, Dessau-Ziebigk in Anhalt, Germany, assignors to I. G. Farbenindustrie Aktiengesellschaft, Frankfort-on-the-Main, Germany, a Corporation of Germany.

A lacquer for coatings on metal surfaces comprising benzyl cellulose dissolved in a mixture of an aromatic hydrocarbon and an aliphatic alcohol, and a heavy metal compound of the group consisting of copper naphthenate, copper, oleate, lead naphthenate, lead linoleate, ferric stearate, ferric laurate, ferric resinate.

1,845,029. February 16, 1932. **Autogenous Welding.** Joseph W. Meadowcroft, Philadelphia, Pa., assignor to Edward G. Budd Manufacturing Company, Philadelphia, Pa.

A filler body for use in autogenous welding of metals of the aluminum group which consists of a piece of metal of that group carrying directly on the surface thereof and adherent thereto a coating of a flux mixed in a water solution and dried on the piece of metal.

Equipment

New and Useful Devices, Metals, Machinery and Supplies

New Type Rubber Lining for Pickling Tanks

Fundamental advances in design of tanks for steel pickling, or acid containing, such as electroplating solutions, are announced by The B. F. Goodrch Company, Akron, Ohio, through Dr. Howard E. Fritz and J. R. Hoover, chemical sales department. Using "Triflex" rubber, adhered by the patented "Vulcalock" process, and protective sheathings of wood or brick, the new development affords structural strength and permanence hitherto unattainable in pickling work, it is stated.

"Triflex" is a new form of rubber lining especially designed to meet the severe conditions encountered in pickling. In construction a layer of hard rubber is cushioned between two layers of soft rubber. The hard rubber serves to resist penetrating and deteriorating effects of acid, oils and oxidation, and also imparts mechanical strength and stiffness to the lining. The soft rubber layers serve to cushion the hard layer from the effects of sharp blows. Special expansion joints are provided which absorb strains incident to expansion and contraction with temperature changes, effectively preventing distortion and crackling of the hard rubber. "Triflex" thus combines advantages of both hard and soft rubber and eliminates, through sound engineering practice, apparent weaknesses of both, it is stated.

This three-ply construction has proved remarkably immune to physical damage by shock, impact or gouging. Actual resistance to impact is nearly 100 times that of ordinary rubber linings, it is claimed.

In addition, "Triflex" is said to combine resistance of true hard rubber to chemical and solvent action, diffusion and absorption, with the resilience and wear resisting qualities of the soft rubber face layer.

Relative thickness of the three plies may be varied within rather wide limits to obtain desired properties for each type of service. Sudden variations in temperature, which are often hazardous to ordinary hard rubber linings, are said to have no adverse effect on the three-ply construction with expansion joints. The "Vulcalock" process is used exclusively by Goodrich for bonding soft, acid-proof resilient rubber to metal. It insures practically integral adhesion between rubber and steel to withstand a minimum rip-shock of 500 pounds per square inch.

Brick or wood sheathings are installed to insure freedom from damage to the rubber through gouging or impact of heavy steel parts. Brick sheathings also have the merit of lowering the temperature at the rubber surface to a point where effects of acid and oxidation are negligible. A four inch brick sheathing, for example, will reduce temperature from 212° F. to 153° F. at surface of rubber. This insulating effect persists in spite of acid seepage through the brick, it is stated.

Steel Pickling Tank Covered with Rubber by New B. F. Goodrich Company Process

A successful three-year period of proving, in actual service, preceded announcement of the new method. Lined with "Triflex," and sheathed with wood or brick, steel tanks are durable, leakproof and economical, it is claimed. Should repairs be necessary they are easily accomplished, with little lost time.

For full information on this development write to Department RL, B. F. Goodrich Company, Akron, Ohio.

New Flux for Galvanizing Gives Improved Frothing

No. 20 galvanizing flux is a new product developed by Hanson-Van Winkle-Munning Company, Matawan, N. J., for use in hot zinc galvanizing baths. The material is said by the maker to provide improved frothing of the bath without addition of bran, sawdust or other ingredients, while containing nothing which might harm the work.

The new flux was developed after considerable laboratory research. It is sold in the form of fine crystals. According to the maker, the self-contained frothing agent makes it possible to obtain from each pound of the material a uniform, constant, effective froth which acts as a blanket as well as a wetting agent for the work. Fumes are said to be greatly reduced, and the slightly explosive "spitting" generally encountered when immersing wet work in the molten zinc eliminated. Higher speed is possible, especially on such work as wire, pipe and similar work usually requiring considerable skimming of flux to remove char.

No. 20 flux can also be dissolved in water to make a wash which is said to have advantages over older methods. One such advantage is the possibility of carrying over enough flux to help maintain the flux strength of the bath.

Jeweler's' Encasings in Concentrated Solution

Concentrated solutions for electrodeposition of jewelry encasings are offered by Everbright Products Company, 31 Fremont Street, Taunton, Mass. All types of precious metal solutions are available, including white gold, red gold (10, 14, 16 and 18 carat), green gold, yellow gold and rhodium. The maker states that solutions are prepared by experts and will provide with minimum labor and expense bright, heavy, hard and adherent deposits in a single operation. Base metals can be advanced to standard plates such as 1/40, 1/20 or 1/10. Strict uniformity is claimed.

with use of low voltage. No royalties or installation fees are charged. Control is by special instrument supplied by the company. Special insoluble anodes for gold baths are provided without charge. The concentrates are prepared to provide from 1 to 4 gallons of solution. A laboratory is maintained by the company at Providence, R. I., to provide service on encasings. This is in charge of Joseph Cassidy, 42 Duncan Avenue, Providence.

Test Set for Metal Cleaner

A small set of apparatus for accurate testing of metal cleaning solutions has been developed by the Kocour Company, 4724 South Turner Avenue, Chicago, Ill., manufacturers of a variety of solution testing sets for many purposes. The cleaner test set is said to provide a simple means of determining the relative strength of an alkaline cleaning solution. The set includes a bottle of indicator solution and a bottle of standard acid, each with dropping pipette, and an empty bottle with calibrated dropping pipette for use with sample. These are packed neatly in a box measuring 5 by 2 by 5 inches. Full directions are given, the operations being very simple and direct.

Kocour Cleaner Test Set

The maker states that regular use of the set on alkaline cleaners will save much material now wasted by guesswork as to its strength.

Rust Preventive

"Rust-Tox," a rust prevention material, is offered by The Skybryte Company, 1919 East 19th Street, Cleveland, Ohio. The material is stated to provide a means of preventing rusting of iron and steel and also a means of killing rust before repainting on maintenance work.

It is claimed that application of the material to rusty surfaces provides a means of preventing all further rusting, and that the surface so treated may then be painted without cleaning. The "Rust-Tox" is also applied without cleaning of any kind.

The material is a colorless, transparent fluid. It may be applied thus for undercoats, or it may be pigmented. It is said to be a good medium for aluminum powder. It can be brushed or sprayed at any temperature above 35°F.

Hammond Variable Speed Polisher and Buffer

A new polishing and buffing lathe featuring variable speed by means of a special speed-changing pulley is offered by Hammond Machinery Builders, Inc., Kalamazoo, Mich. The machine is said to introduce some radical changes in polishing equipment, meeting the modern demand for variability of speed to meet varying requirements, and to make full use of wheels as diameter is decreased through wear. The new Hammond machine employs a V-belt drive and the Hammond patented pulley which provides a wide range of speeds which may be changed easily and rapidly. Any speed within a 50% increase of the rated low speed of the machine is available; for example, speeds ranging from 2,000 to 3,000 r.p.m.; from 1,800 to 2,700; from 1,500 to 2,250. Changes as small as 25 revolutions are possible. By using a Hammond variable speed pulley on the drive motor as well as on the lathe spindle the range of speed variation can be further increased; also by changing to another size pulley on motor.

The standard machine of this type has a variable speed pulley on the spindle with solid sheave on motor. Changes in speed are made by expanding or contracting the special pulley to a Vernier scale letter and corresponding speed figure on a speed chart directly in front of operator. One minute is said to be the average speed-changing time.

The new machine has the same general features as the Hammond "Rite-Speed" line of machines. It is made in 3, 5, 7½ and 10 hp. capacities; single spindle or double spindle with independent spindle control types.

New Hammond Machine

Farrel-Sykes Gears

Farrel-Sykes gears have been used wherever gears are applicable, for the past ten years. For every ordinary application they are recognized by all progressive engineers to be the best available, but it is not generally known how extensive the field of their application is, the makers state. One example which is especially interesting is their application to airplanes. They are used for transmitting the power from the engine to the propeller of high powered ships. Farrel-Sykes gears have been standard on the Curtiss Conqueror engine for the past three years. The gears are manufactured by Farrel-Birmingham Company, Ansonia, Conn.

Sandslinger Aids Production

To produce the lighting standards for lighting 250 miles of Chicago residential districts within 120 days, the Cleveland, Ohio, plant of the Westinghouse Electric and Manufacturing Company was equipped with special machinery. Part of the equipment consisted of a special foundry sandslinger which operates with great rapidity and force, thereby eliminating all hand tamping. Eight thousand standards were cast at a minimum rate of ninety-six per day. All the fluted standards, capitals, sockets and aluminum canopies for this lighting installation were produced and shipped within the allotted time.

Sand slinger filling a flask preparatory to casting lighting standards for the City of Chicago at the Cleveland, Ohio, works of the Westinghouse Electric and Manufacturing Company.

Safe Barrel-Handling Truck

A line of equipment for safe handling of barrels, carboys, drums and other containers for liquids, especially acids and other high corrosives and dangerous materials, is manufactured by the Hoist and Crane Engineering Company, Inc., Engineering Building, New York, and distributed by Tidy Products, Inc., Chrysler Building, New York. The equipment is known by the brand name "Truly Safe."

Simplicity of design, safety and efficiency have been kept in mind constantly in development of the line, the makers state. Trucks are available in a variety of styles for moving, tilting, holding and otherwise handling the containers in general industrial and laboratory use. Special types of equipment to meet individual needs are also available on specification.

Left — "Truly-Safe" Barrel Holder and Lift Truck. Right—Same Equipment in Position for Moving.

Equipment and Supply Catalogs

Brazing and Welding Compounds. Krembs and Company, 669 West Ohio Street, Chicago, Ill. Leaflet on "Fluxine."

American Nickeloid Company, Peru, Ill., offers an interesting booklet on its history, "Through Thick and Thin for Thirty-four years."

Fire Brick. Laclede-Christy Clay Products Company, St. Louis, Mo. Bulletin on "Mullite," a new type of "super-refractory."

Use and Care of Hoisting Chains. National Safety Council, Inc., 20 North Wacker Drive, Chicago, Ill. Safe Practices Pamphlet No. 98.

Porcelain Enamel. Ferro Enamel Corporation, Cleveland, Ohio. Bulletin announcing a complete line of acid-resisting porcelain enamels.

Colloidal Graphite. Acheson Oildag Company, Port Huron, Mich. Interesting pamphlet on properties, uses and advantages of graphite lubricants.

Hot Strip Reels. United Engineering and Foundry Company, Pittsburgh, Pa. Bulletin N-301, on reels for handling rolling mill products. Fully illustrated.

Gears. Barber-Colman Company, Rockford, Ill. Three very good pamphlets, as follows: Helical Gears; Precision Hobbing; Economical Hobbing. Illustrated.

Lead Pipe. Lead Industries Association, 420 Lexington Avenue, New York. Good information on new standards, as well as technical data on lead pipe plumbing, lead burning, caulking, etc.

Baird Machine Company, Bridgeport, Conn. Good bulletin on a variety of machinery for metal working, finishing, etc., representing the company's very wide line of products. Illustrated.

Cements. Technical Products Company, Sharpsburg Station, Pittsburgh, Pa. Engineers Catalog 32. List of products for cementing, acid proofing, impregnating, furnace sealing, heat treating, etc.

Management. Elliot Service Company, Inc., 242 West 55th Street, New York. This publication has been put into new form, 8½ x 11 in. It is issued periodically and sold by subscription. Content covers various aspects of managerial development work. Prospectus is available.

Aluminum Alloys. Birmabright, Ltd., Dartmouth Road, Smethwick, Nr. Birmingham, England. Reissue of a very interesting brochure on light alloys supplied by this subsidiary of the Birmingham Aluminum Casting Company, Ltd. It has been enlarged and beautifully printed.

Fuels. Combustion Engineering Corporation, 200 Madison Avenue, New York. Reprints: "Tangential Firing of Gaseous and Liquid Fuels"; "Corner Firing of Blast Furnace Gas"; and "Combination Burning of Blast Furnace Gas and Pulverized Fuel"; all by Otto de Lorenzi.

Furnaces. W. S. Rockwell Company, 50 Church Street, New York. Bulletins Nos. 325 to 334, on furnaces for carburizing; heat treating; continuous type; industrial all electric and fuel. Also, electric convector furnaces; blast gates; air service; continuous furnaces; nonferrous billet heating furnace. Fully illustrated.

Chemicals. Roessler and Hasslacher Chemical Company, Empire State Building, New York, has issued: Sodium Perborate, a leaflet on a refrigerant; Peroxygen Compounds, booklet on properties and uses of various peroxides and perborates, giving complete specifications and other data. Some of the materials are used in metal finishing or processing. Also, April **Quarterly Price List** of all R and H products.

Process for Removal of Vitreous Enamel

A process for removing vitreous enamel by means of a material known as "Vitrosol" is offered by the Diversey Corporation, 53 West Jackson Boulevard, Chicago, Ill. The de-enameling process is described as a means of reclaiming pieces rejected due to defects in enamel. It is said to be suitable for use in plants where enameling is performed on a production scale, and it is claimed that considerable savings can be effected by means of the "Vitrosol" process.

It is, briefly, a method of dissolving the vitreous enamel on a defective piece of work and thus rendering the base metal again clean for enameling. It is stated that the process has shown good results for several years in de-enameling stove parts, refrigerator liners, washing machine tubs, etc.

A leaflet, "Salvaging Defects by De-Enameling," is available to readers on application to the Diversey Corporation.

Adjustable Ventilating Fan

Vallen Electrical Company, Inc., Akron, Ohio, announce the "Vallen Adjustable Volume Ventilating Fan" as an addition to its regular line of special-purpose, electrically operated equipment. The maker states it is a unique fan, the result of many years of experimenting and research, designed for peculiar applications where ordinary ventilating fans are not suitable.

The fan shaft is at right angles to the motor driving shaft, with power transmitted through specially constructed gears which provide a positive drive. All shafts are carried on ball bearings. A feature of the fan is its adjustable pitch blades. The pitch of the blades can be adjusted to exactly meet the needs of the installation, whether it is to exhaust hot or cold air, steam, fumes, spray, smoke, dust, odors, etc. By blade adjustment the specific gravity or weight of various elements can be compensated for.

Vallen Ventilating Fan

The manufacturer states that the fan was designed especially for duct installations. Motor is mounted outside the duct, away from harmful elements. Fan blades were designed especially for this purpose by an aviation engineer, and their unusual design provides the unit with high efficiency, it is stated.

Metal Developments

ALUMINUM wire and cable consumption by electric light and power companies in 1931 is reported by American Bureau of Metal Statistics as follows: of 150 companies asked for reports, 72 reported use of some aluminum, the totals reported by these amounting to 802 pounds of bus bars; 378,204 pounds bare wire; 43,153 pounds (gross weight) insulated wire; 5,288,153 pounds (gross weight) cable, steel reinforced. The report stated that the figures were below 1930, in ratio, perhaps, of 2:1, and that the use of aluminum was more curtailed than the use of copper for the same purposes.

ZINC COATING of steel wire to produce a superior type of galvanized wire is planned for the near future by a large steel company in the Baltimore district, it is reported. The Tainton method of leaching zinc concentrates and using the solution for an electrolytic zinc bath is contemplated, it is stated. The process eliminates anodes.

GOLD PLATED fittings were used on a model of the Japanese liner Chichibu Maru recently exhibited in the United States. It is said the gold plate raised the tariff on the model $600 to a total of $1,689.

ALUMINUM—Two new uses of aluminum reported last month were the idea of making phonograph records of this material, and its use for display cases for museums, art galleries, etc. The record idea emanates from Germany. It is said that perfect matrix impressions have been obtained by coating the discs with a special lacquer, the coating taking the grooves. An old record can be used again by heating the disc to 80° C., and re-pressing. Such records are only 0.5 mm. thick and weigh 50 grams, as against 2 mm. and 200 grams for the conventional records now used. Other advantages include superior surface, wear, moisture and temperature resistance of the lacquer, and good tonal qualities of reproduction. The display cases mentioned were pioneered by A. N. Russell and Sons, Ilion, N. Y.

FOUNDRY UNEARTHED. A press dispatch from Vatican City, Rome, Italy, last month stated that the ruins of the old pontifical foundry where cannon were cast for the Papal armies, have been found by excavators for the new Vatican Postoffice. The foundry was built under Pius IV, who was Pope from 1559 to 1565, when the Church was a military as well as a spiritual power. It fell out of use long ago. Metal statues, including that of Napoleon in the Place Vendome at Paris, also were cast in the Papal foundry.

COPPER was used for construction of the cupola dome of the reproduction in Bryant Park, New York City of the old Federal Hall by the New York Washington Bicentennial Commission.

Current News of Associations and Societies

American Electroplaters' Society

Los Angeles Branch

Annual Educational Session

The third annual educational session and dinner dance of the Los Angeles Branch was a brilliant affair.

The dinner dance was by far the best the branch has held. The attendance was greater than expected, and the benefits were large, socially as well as financially.

There were no exhibits on display this year other than those which were donated as prizes.

A list of donors and winners follows:

Donor	Winner
Maas and Waldstein Company	E. Lamoureux
Edison General Electric Appliance Company	H. H. Woodward
U. S. Spring Bumper Company	R. F. Magnus
Turco Products, Inc.	Distributed
Cal. Brass Manufacturing Company	S. A. Richmont
S. and M. Lamp Company	E. P. Robinson
Repeal Brass Manufacturing Company	Mrs. E. Crooks
Price Pfister Brass Manufacturing Company	T. Kzeuder
Palace Plating Company	Geo. Kyle
Oakite Products, Inc.	Distributed
National Chemical Company	C. Dennis
Liberty Electro-Plating Company	Mrs. E. Lamoureux
Stauffer Chemical Company	E. P. Robinson
American Die Casting Company—three prizes	Gertrude Rynkofs, F. E. Shaw, G. Aballi
Agate Lacquer Manufacturing Company	Favors for all ladies
J. B. Ford and Company	H. Marmer
W. E. Hurd—two prizes	Mr. Fuller, Mrs. Fuller

The educational program was as follows:

Gold Solutions for Production Work, by J. L. Merigold.

Hot Nickel Solutions and Low pH, by A. Regmunt, U. S. Bumper Company.

Deposition of Chromium on Electric Appliances, by F. A. Maurer, Edison Electric Appliance Company. Job Shop Practice, by R. U. Gripp, Russell Plating Company. Some New Thoughts on Electrolysis, by Dr. S. Fall, Los Angeles Board of Education.

Summary of Research at U. S. Bureau of Standards, delivered by E. Lamoureux.

Society for Testing Materials

A sub-committee of the American Society of Testing Materials, 1315 Spruce Street, Philadelphia, Pa., Committee E-4 on Metallography is actively engaged in investigative work in the X-ray and gamma ray testing field. This group of men, comprising Sub-committee VI on X-ray Methods, has been considerably enlarged. Four experts on the subject have been added as new members and invitations will be extended to others to cooperate in the work.

Certain power cable interests have become greatly interested in the examination of lead and lead alloy cable sheaths. With this in view, and because of the dearth of concise information, there has been prepared a technical report, with comments by several members of Committee E-4, on the subject of Metallographic Methods for the Examination of Lead and Lead Alloys. Since this promises to be of great value to the power cable industry and to all users of lead sheath cable, it is planned to publish, at the time of the next A. S. T. M. annual meeting, a technical paper on the subject. A recommended practice will be included with the present revision of the Recommended Practice for the Examination of Non-Ferrous Alloys.

Sub-committee I of E-4 on Selection and Preparation of Samples, E. H. Dix, Jr., Metallurgist, Aluminum Research Laboratories, Chairman, is actively engaged in reviewing the present Standard Methods of Metallographic Testing of Non-Ferrous Metals and Alloys (E 5-27).

R. E. HESS, Assistant Secretary.

National Metal Trades

National Metal Trades Association, Chicago, Ill., held its 34th annual convention and banquet April 20 at the Hotel Commodore, New York. The meeting was well attended by members from all parts of the country. J. G. Benedict of Landis Machine Company, Waynesboro, Pa., presided. Guest speaker was Rep. James M. Beck of Pennsylvania, whose subject was "The Present Crisis."

Officers of the association for the coming year were elected as follows: Jacob D. Cox, Jr., Cleveland, Ohio, president; Alexander Sellers, Philadelphia, Pa., first vice-president; C. H. Strawbridge, Chicago, Ill., second vice-president; J. W. O'Leary, Chicago, Ill., treasurer; councillors for two years: J. G. Benedict, Waynesboro, Pa., E. C. Bayerlein, Milwaukee, Wis., Harold Edwards, Syracuse, N. Y., N. W. Pickering, Farrel-Birmingham Company, Ansonia, Conn., A. H. Starrett, Athol, Mass, and A. H. Timmermann, Wagner Electric Company, St. Louis, Mo.; councillor to fill unexpired term, W. D. Hamerstadt, Indianapolis, Ind. Homer D. Sayre continues as commissioner; J. E. Nyhan remains national secretary.

American Zinc Institute

The American Zinc Institute re-elected Ralph M. Roosevelt, vice-president, Eagle-Picher Lead Company, president at its annual meeting at St. Louis, April 18-20. Other officers: A. P. Cobb, J. O. Elton, and John A. Robinson re-elected vice-presidents; Howard I. Young elected treasurer; Julian D. Conover, secretary.

Institute of Metals

The Twenty-second Annual May Lecture of the British Institute of Metals was delivered by Professor Dr. F. Körber, Director, Kaiser Wilhelm-Institut für Eisenforschung, Düsseldorf, Germany, on Wednesday, May 11, at London, the subject being "The Plastic Deformation of Metals."

Coming Meetings

American Electroplaters' Association: Annual convention, Benjamin Franklin Hotel, Philadelphia, Pa.: June 20 to 23, inclusive. See page 184.

National Metal Congress and Exposition: 174th Regiment Armory, Buffalo, N. Y.; October 3 to 7, inclusive. W. H. Eisenman, 7016 Euclid Avenue, Cleveland, Ohio, director. The Congress is sponsored by American Society for Steel Treating; American Society of Mechanical Engineers; American Institute of Mining and Metallurgical Engineers (Institute of Metals and Iron and Steel Divisions); American Welding Society; Wire Association.

International Fellowship Club. The usual annual meeting will be held during the convention of the American Electroplaters' Society, which takes place at the Benjamin Franklin Hotel, Philadelphia, Pa., June 20 to 23, inclusive.

International Tin Committee

The International Tin Committee of London, England, announces the formation of a Research and Development Section to take over the functions and operations of the Tin Research and Industrial Applications Committee.

The Research and Development Section will carry forward the program of the former Committee which is:

1. To extend the present uses for tin.
2. To develop new uses.
3. To preserve and strengthen existing markets.

The work includes scientific and industrial research now under way and to be undertaken, commercial publicity, and the compilation and tabulation of statistics, all of which will be freely available to consumers of tin.

The Research and Development Section is organized to co-operate with American tin consuming industries in the solution of problems involving the industrial applications of tin, and it is proposed to carry on much of the research work in this country. An office is maintained in New York City at 149 Broadway, Room 2810, in charge of L. J. Tavener, in order that the utmost service may be rendered to American tin consuming industries, and to co-ordinate the Research and Development program with American research activities. Correspondence is invited on all subjects coming within the range of the functions of the Research and Development Section.

Connecticut Foundrymen

Connecticut Nonferrous Foundrymen's Association held a meeting recently at New Haven. Speaker was V. P. Weaver of American Brass Company, on "Copper and Its Alloys." At another meeting, Furman South, Jr., of Lava Crucible Company, Pittsburgh, Pa., spoke on problems concerning refractories in the modern nonferrous foundry.

Die Casting Institute

At the request of the American Die Casting Institute, the United States Department of Commerce will make a survey of the die casting industry, with a view to elimination of distribution wastes. A committee of the Institute will co-operate with the government. W. G. Newton, president of the Institute, heads this committee.

Directory of Metal and Finishing Associations

INFORMATION NOT LISTED CAN BE OBTAINED BY APPLICATION TO METAL INDUSTRY

American Foundrymen's Association, 222 West Adams Street, Chicago, Ill.

Connecticut Nonferrous Foundrymen's Association, secretary, C. D. Elliott, Wilcox, Crittenden Company, Inc., Middletown, Conn.

Metropolitan Brass Founders' Association, secretary, William E. Paulson, Thomas Paulson and Son, Inc., 450 Union Street, Brooklyn, N. Y.

Philadelphia Foundrymen's Association, secretary and A. F. A. representative, E. S. Sparks, 1623 Sansom Street, Philadelphia, Pa.

American Electroplaters' Society, care of H. A. Gilbertson, 434 South Wabash Avenue, Chicago, Ill. Secretaries of Branches of the American Electroplaters' Society are the following:

Anderson, Ind., R. M. Wagner, 28 West 12th Street.
Baltimore-Washington, I. H. Hahn, 207 South Sharp Street, Baltimore, Md.
Boston, A. W. Garrett, 45 King Street, Dorchester, Mass.
Bridgeport, T. H. Chamberlain, 859 Orange Street, New Haven, Conn.
Chicago, Ill., E. G. Stenberg, 2200 North Kenneth Avenue.
Cincinnati, A. Yeager, 2021 Sherman Avenue, Norwood, Ohio.
Cleveland, P. R. Stamm, 947 Elbon Road, Cleveland Heights, Ohio.
Dayton, Ohio. W. Protsman, 141 Westwood Avenue.
Detroit, Mich., C. M. Phillips, 18933 Hickory Avenue.
Grand Rapids, Mich., J. Van Dyke, 1361 Union Avenue.
Hartford-Connecticut Valley, V. Grant, 32 Jennings Road, Bristol, Conn.
Indianapolis, Ind., L. Mertz, 1725 Union Street.
Los Angeles, Calif., M. D. Rynkofs, 1354 West 25th Street.
Milwaukee, Wis., F. J. Marx, 1431 West Cherry Street.
Montreal, Quebec, Canada, Charles Doherty, 1437 Aylmer Street.
Newark, G. Reuter, P. O. Box 201, Newark, N. J.
New York, J. E. Sterling, 2581 46th Street, Astoria, L. I.
Philadelphia, J. E. Underwood, 327 North 10th Street, Camden, N. J.
Pittsburgh, S. E. Hedden, 227 Fifth Street, Aspinwall, Pa.
Providence-Attleboro, J. H. Andrews, 19 Rosedale Street, Providence, R. I.
Rochester, N. Y., C. Griffin, 24 Garson Avenue.
San Francisco, Calif., H. W. McKibben, 310 Tehama Street.
St. Louis, C. T. McGinley, 8214 Fairham Avenue, University City, Mo.
Toledo, J. M. Lee, Barker Street, Fremont, Ohio.
Toronto, Canada, H. W. Graham, 102 Robina Avenue.
Waterbury, W. F. Guilfoile, P. O. Box 961, Waterbury, Conn.
Worcester, Mass., R. H. Bryant, 94 Grove Street.

International Fellowship Club, T. A. Trumbour, Metal Industry.

Institute of Metals Division, A.I.M.E., 29 West 39th Street, New York City.

American Electrochemical Society, Columbia University, New York City.

American Society for Testing Materials, 1315 Spruce Street, Philadelphia, Pa.

Institute of Metals (Great Britain), 36 Victoria Street, Westminster, London, S. W. 1, England.

Electroplaters' and Depositors' Technical Society (Great Britain), Northampton Polytechnic Institute, St. John Street, London, E. C. 1, England.

Tin Research and Industrial Applications Committee, L. J. Tavener, U. S. Representative, Room 2810, 149 Broadway, New York.

Personals

Charles B. Little

Charles B. Little, formerly treasurer, has taken over the business of Charles J. Bogue Electric Company, Sixteenth Street and River Front, Hoboken, N. J., the founder and head of which, Charles J. Bogue, died on February 24 (see "Obituaries").

Mr. Little, who is a nephew of the late Mr. Bogue, has been actively interested in

CHARLES B. LITTLE

the company for about 32 years. He has seen the firm's progress through the years, and has been an important factor in the development and sale of the company's products, generators and motor-generator sets for electroplating, electrotyping, welding, gasoline electric sets, and other electrical equipment.

The business, according to Mr. Little, will be continued with no material change in the policies which were determined during the life of the founder. While "new blood" will be introduced in the engineering end of the business, Mr. Little plans to carry out the ideals of his former chief, whose object always was to produce fine equipment with all the modern improvements found to be of advantage to the machines. Mr. Little has been the company's chief designer for many years, and he will therefore have no difficulty in maintaining the high standards for which Bogue products have always been notable. The actual designing work will now be relegated to engineers highly qualified to attend to this branch of the engineering department, thus permitting Mr. Little to devote his entire attention to the executive duties which formerly were under Mr Bogue's care.

N. H. Mackay of the U. S. Chromium Corporation, Wilkinsburg, Pa., addressed the Railway Club of Pittsburgh, Pa., recently on the subject: Application of Chromium Plating in the Railway Field.

Charles F. Burgess

Charles F. Burgess, head of the Burgess Laboratories, Madison, Wis., was recently awarded the Perkin Medal for 1932 by the Society of Chemical Industries, in recognition of his work in electrochemistry.

Mr. Burgess was born at Oshkosh, Wis., January 5th, 1873. He graduated from the electrical engineering course at the University of Wisconsin in 1895, and then took up a study of physical chemistry and electrochemistry, at the same time engaging in instructional work. He organized the departments of Applied Electrochemistry and Chemical Engineering at the University of Wisconsin, of which he had charge until 1913. During this time he carried on many lines of research in chemistry and metallurgy. When the State of Wisconsin undertook the regulation of public utilities he was employed as engineer of the Railroad Commission to formulate standards for gas and electric service.

In 1910 he entered the field of industrial research, organizing the C. F. Burgess Laboratories, outgrowth of which have been various industries, including Burgess Battery Company, Burgess-Parr Company, Wood Conversion Company, and Burgess Cellulose Company.

During the World War he served on the District Draft Board for Southern Wisconsin, and had charge of the development and production of smoke screen chemicals at Niagara Falls.

He was one of the founders of the American Electrochemical Society, and was

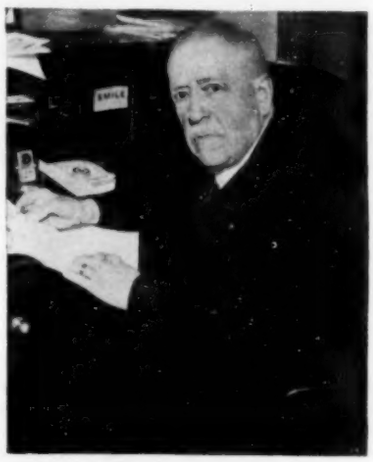
CHARLES F. BURGESS

its president for 1906. He is a member of various other scientific and engineering societies, including Society of Chemical Industry, Royal Institution of Great Britain, American Chemical Society, and Western Society of Engineers, by which last Society he was awarded the Octave Chanute Medal for 1911 for work done on corrosion of iron.

William B. Anderson

William B. Anderson, president of the Buckeye Iron and Brass Works, Dayton, Ohio, recently celebrated his seventy-sixth birthday. He has been in business for fifty-six years.

Mr. Anderson started his career with the Buckeye when it succeeded Hoglen and Pease in 1876. He was a stockholder but held the position of shipping clerk until the beginning of the following year, when he became secretary. In 1916, a reorganization took place, and Mr. Anderson was elected president. He has seen the company's capitalization grow from $75,000 to $250,000. A very complete line of gasoline handling equipment is manufactured



WILLIAM B. ANDERSON

by the company, including hose nozzles, filling station accessories, and equipment for plants handling gasoline in bulk. Many other types of product are also made in brass and iron.

Mr. Anderson has seen the growth of Dayton from a muddy-streeted town into the city it is today. His firm has remained in one location longer than any other in Dayton.

At seventy-six Mr. Anderson remains hale and hearty, appears at his desk every day, and actively directs the company's affairs. He looks forward optimistically to an early improvement in general business.

R. S. Archer, director of metallurgy, A. O. Smith Corporation, Milwaukee, Wis., addressed the Detroit section of the American Society for Steel Treating on March 14. His subject was the use of aluminum in the automotive industry.

Arthur C. Carlton, formerly with Baltimore Copper Smelting and Rolling Company, Baltimore, Md., has been appointed director of geology and mineralogy of the Chicago Industrial Museum, Chicago, Ill., now under construction.

C. E. Birch, Whitehead Metal Products Company, Boston, Mass., and **E. J. Bothwell,** International Nickel Company, New York, discussed application of nickel to cast iron at a meeting of the New England Foundrymen's Association at Boston, March 9.

Carl V. Dodge, manager of roll and steel casting sales of United Engineering and Foundry Company, Pittsburgh, Pa., has been elected a vice-president of the company. He has been identified with roll and steel casting production and sales of the company for 26 years.

Wilfred S. McKeon, president of the W. A. Fuller Company, Inc., Greensburg, Pa., manufacturers of "Natrolin" industrial cleaning preparations, has returned to Greensburg after a southern tour and a visit at Miami Beach, Fla. Mr. McKeon is still as travel-minded as ever, though, and now plans an attack on Ireland. He expects to sail in about two months for Dublin, where he will attend the Catholic Eucharistic Congress, June 23-26.

E. D. Seabright, Ohio State University '30, formerly with Tennessee Enamel Manufacturing Company, is now with Ferro Enamel Corporation, Cleveland, Ohio, as a member of the Laboratory staff. **J. A. Abbott** has joined Louisville Enameled Products Company, Louisville, Kentucky, having previously been with Ferro Enamel Corporation. **Allen A. Apple** has become associated with Ferro Enamel Corporation, coming from Youngstown Pressed Steel Company, Warren, Ohio.

Mackintosh-Hemphill Personnel Changes

A sales-conscious management has been placed in command of an old and historically famous rolling mill machinery company through the election of Colonel J. S. Ervin as president and member of the board of directors of the Mackintosh-Hemphill Company, Pittsburgh, Pa., builder of rolling mills for every type of metal.

Colonel Ervin is an engineer by training,

COL. J. S. ERVIN

but his entire business life has been spent in sales work since he left Ohio State University. He was recently vice-president in charge of sales for one of the largest companies engaged in the processing of steel structural materials, and directed a nation-wide sales organization for that company. He handled some of the largest contracts in connection with the Navy's Zeppelin factory and dock at Akron, Ohio. He has also sold skylights, ventilators, road materials, electric power and other products. He was in the army during the war and is now commander of the 508th Regiment, Coast Artillery, Anti-aircraft, which is charged with responsibility for the anti-aircraft defenses in the steel and munitions-producing districts around Pittsburgh.

Colonel Ervin will be surrounded by a competent technical staff. **F. Hughes Moyer** was elected vice-president and senior engineering officer. He was formerly chief engineer successively of the Illinois Steel's Gary plant, the Bethlehem Steel's Johnstown plant, and the Carnegie Steel's Clairton plant.

H. E. Field, formerly president of the Wheeling Mold and Foundry Company, and formerly vice-president of the Continental Roll and Steel Foundry Company, was also elected a vice-president.

F. C. T. Daniels, an authority on rolls construction, was elected chief metallurgist and chief research engineer. Other officers elected were **Donald H. Baum,** secretary; **W. C. Rice,** treasurer; **C. Howard Paul,** assistant treasurer, and **J. R. Patterson,** divisional sales manager.

The Mackintosh-Hemphill Company was organized in 1803, when its founders built the first foundry west of the Alleghenies. It has built almost a thousand mills for the rolling of steel, zinc, lead, tinfoil, aluminum, copper and other metals. It has built and shipped complete mills to Japan, India, Russia, Belgium, Australia and other parts of the world.

For years the company had a natural monopoly in its field, and until very recently it had accounted for as much as 90% of the mills of a given type in the country.

Roessler and Hasslacher Personnel Changes

The Roessler and Hasslacher Chemical Company, Inc., New York, subsidiary of E. I. du Pont de Nemours and Company, Inc., announces that **Dr. H. R. Carveth,** president of R & H since 1928, and with the company 26 years in all, has retired. **Dr. M. J. Brown,** vice-president, who had been with the company 21 years, also retired. The announcement was made at a directors' meeting March 28. Both officials were directors, and retired from the directorate as well.

Drs. Carveth and Brown are succeeded as follows: **Charles K. Davis** of New York will be president and general manager of the company. **Dr. A. E. Rykenboer,** formerly vice-president, will be vice-president and assistant general manager. All other officers and directors were re-elected.

Obituaries

H. R. Corse

H. R. Corse, sales manager of Lumen Bearing Company, bronze and brass founders of Buffalo, N. Y., died February 20, 1932. He was apparently in good health until the day of his death, when he was stricken suddenly with a fatal heart attack at his home in Buffalo.

Hugh Reginald Corse was born February 29, 1880, at Malden, Massachusetts, educated in the Massachusetts public schools, and graduated from the Medford High School, Medford, Massachusetts.

He was first employed in the manufacture of rubber goods in Connecticut. In 1905 he moved to Detroit, Mich., where he engaged in the radiator business, automobile manufacturing, and selling mill supplies. In 1910 he joined the sales department of the Lumen Bearing Company, Buffalo, New York, and was connected with this company until his death, with the exception of the six years between 1914 and 1920, when he was with the Titanium Bronze Company, Niagara Falls, New York. His specific work was promoting sales and use of high grade alloys of brass and bronze.

He was active in automotive circles, having been a member of the Society of Automotive Engineers and an active worker in the S. A. E. Committee dealing with non-ferrous alloys, particularly those in the cast state. He was also a member of the Buffalo Engineering Society and other technical bodies.

He married Ellen C. Ives in Detroit in 1906. He is survived by his widow, a son

H. R. CORSE

William, and a daughter Dorothy. He had made his home in Buffalo since 1916. He was a brother of W. M. Corse, secretary-treasurer of the Institute of Metals Division, American Institute of Mining and Metallurgical Engineers.

Harvel Z. Kelly

Harvel Z. Kelly, 59, representative for National Bearing Metal Company, Pittsburgh, Pa., died at Youngstown, Ohio, March 18, 1932. He had been previously connected with Falcon Bronze Company, Youngstown, Ohio.

Wilbur F. Rogers

Wilbur F. Rogers, 89, retired silverware manufacturer, died at Meriden, Conn., March 5, 1932. His company, formed with two brothers, was purchased many years ago by the International Silver Company.

Obituaries

Charles J. Bogue

Charles J. Bogue, founder and for 40 years head of Charles J. Bogue Electric Company, Hoboken, N. J., died February 24, 1932. He was 75 years old.

Mr. Bogue was in good health up to a short time before his death, when he caught cold and suffered congestion which he could not withstand. Mr. Bogue received his early education at Massachusetts Institute of Technology. At the time of his death he was a candidate for mayor of Bloomingdale, N. J., where he lived.

CHARLES J. BOGUE

The death of Mr. Bogue removes from the electrical equipment industry catering to the electrodeposition lines one of its most distinguished members. As a manufacturer, he will always be remembered for his generosity in all dealings, and his high standards of production. Always very modest, his accomplishments were never proclaimed, although they were such that none who knew him could fail to appreciate them sooner or later. His high qualities were especially recognized by his associates and employes. He made many friendships and earned much admiration by his constant sympathy toward men of smaller means with whom he came in contact in the course of business.

It is said of Mr. Bogue that had he so desired, he might have reached the very highest places in the largest electrical manfacturing companies. In the early eighties he had thrown in his lot with the then pioneering electrical industry, and was very active in the development of power in America, Australia, New South Wales and New Zealand. He helped to introduce some of the very first electric lighting plants in Sydney and Melbourne, Australia, and while abroad made friends of many of the highest government officials of the countries in which he worked. He had substantial backing in his Australian venture, and held contracts whose potential values ran into the millions. Indeed, millions were made out of the developments in which he was first interested, and there was no reason why he might not have realized these profits himself had he chosen to stay abroad. However, the nature which endeared him to so many friends forbade that course, and he came back to this country largely because his wife was extremely homesick.

Even then, Mr. Bogue might have accepted some of the very good offers made him by a number of the larger electrical interests who wished him to represent them abroad. But he determined to stay in this country, and in 1892 he established the company which continues to bear his name. Never anxious for the accumulation of wealth, Mr. Bogue devoted himself to the development of equipment which would endure so well as to earn the confidence of every user. In this he succeeded remarkably well. The attitude which as a young man drew him into the electrical industry, then a practically untrodden field, kept him open-minded and progressive throughout his life. This led him to employ a high type of engineering skill at all times, and to investigate constantly all modern developments in his line. Besides electrical equipment for plates, the Bogue company manufactures generating equipment for lighting arc welding, electrotyping, and gasoline electric lighting sets.

Harry S. Whiting

Harry S. Whiting, district manager of the San Francisco office of the Aluminum Company of America, died at Saratoga, Calif., on March 9, 1932. Mr. Whiting was 55 years old, and had been in his office the day before his death.

Born in 1877 at Washington, D. C., Mr Whiting was educated in the schools there. His first business connection was in the bicycle business. He joined the Aluminum Company in 1903, at the St. Louis office. In 1907 he went to the New York office, remaining until 1912, when he went to the Pittsburgh office. In 1915 Mr. Whiting was sent to San Francisco to take charge after his company acquired the Pierson-Roeding Company. He had charge of disposing of the numerous lines in which that firm had been interested, and concentrating its aluminum business.

William G. Ahrendt

William George Ahrendt, head of the firm of silversmiths of his name in Newark, N. J., died April 5, 1932, of heart disease at his home, 545 Alden Avenue, Westfield, N. J., at the age of 48. A widow, two daughters and a son survive.

Michael J. Nowak

Michael J. Nowak, 62, founder and principal executive of Star Plating Company, Buffalo, died March 9 following a heart attack.

Laverne W. Spring

Laverne W. Spring, chief chemist of the Crane Company, Chicago, Ill., died March 23, 1932, in his fifty-seventh year.

Mr. Spring was a metallurgist of outstanding ability, winner of the Penton Gold Medal of the American Foundrymen's Association for 1932. He had been with Crane Company since 1914 as chief chemist and metallurgist. Previous to that he was with Illinois Steel Company and Wolverine Portland Cement Company. He was a member of the editorial advisory board of "Metals and Alloys," through which he contributed some very fine material on brass, iron and steel, the history of metallurgy, and other subjects.

LAVERNE W. SPRING

George Stroh

George Stroh, founder and president, Stroh Die Moulded Casting Company, Milwaukee, died March 1 after a long illness. He was born at Jordan, N. Y., in 1865, and in 1904 went to Milwaukee, where he established a non-ferrous foundry business that became one of the leading concerns in its line in the Middle West.

Jesse J. Armstrong

Jesse J. Armstrong, 64, for many years sales representative of the Rome Brass and Copper Company, Rome, N. Y., of which he was vice-president died at his home in Rome last month. He was well known in the eastern part of the United States. E. K. B.

Ambrose G. Warren

Ambrose G. Warren, vice-president of the Pennsylvania Bronze and Brass Company, Philadelphia, Pa., and treasurer of the Palmyra Foundry Company, Palmyra, N. J., died suddenly on March 16, 1932. He is survived by a widow and his brother, Asaph Warren of Worcester, Mass.

Charles E. Horton

Charles E. Horton, 51 owner of Chicago Aluminum Castings Company, Chicago, Ill., died March 15, 1932.

Industrial and Financial News

Three Pennsylvania Bronze Companies in Merger

The American Manganese Bronze Company, Holmesburg, Pa., has acquired by purchase the good will, equipment and all assets except real estate of Paul S. Reeves and Company and Caskey Brass and Bronze Company, two important Philadelphia foundries. The entire business of the three firms will now be handled at the Holmesburg plant, one of the largest and best equipped foundries in the country. Announcement states there has been no interruption in filling orders of the Reeves and Caskey companies. All three concerns are old and have played an important part in foundry engineering in the United States as well as abroad. All have figured in some of the world's greatest projects, including the Panama Canal, the supply of marine propellers during the war, New York City water supply, Roosevelt Dam, many hydroelectric projects, etc. The Reeves firm began business in 1869, and Caskey was founded in 1875.

Samuel K. Reeves, president of the Reeves company, will be a director and vice-president of American Manganese Bronze Company. Frank E. Shipley, president of the Caskey company, will also be affiliated with the purchasing company, as well as other former Caskey men.

Sheet Zinc Contract

The State of Illinois has awarded a contract to cover the State Capitol Building at Springfield with sheet zinc. This material will be used to cover the dome and for the cornices and ornamental stampings. The Illinois Zinc Company, Chicago and New York, has received the order for approximately 100,000 lbs. of sheet zinc required.

American Business Since 1790

A chart has been drawn up by Cleveland Trust Company, Cleveland, Ohio, under the supervision of Leonard P. Ayres, vice-president, showing graphically the rises and falls of American business activity from 1790 to the end of 1931. It is a clear exposition of American economic progress, and might almost be called a history of American industry in a nutshell.

R. T. Crane Estate Shrinks

A press report last month indicated that the estate of the late R. T. Crane, Jr., who was president of Crane Company, Chicago, Ill., plumbing supply manufacturers, has dropped in value from $19,000,000 at the time of his death in November, 1931, to $5,500,000 in April, 1932. The figures are based on audits made for tax purposes. The chief factor in the shrinkage is said to be the decline in value of Crane Company stock.

Suit for Monopoly Against Aluminum Company Still On

Judge Edwin S. Thomas of the United States District Court in session in Hartford, Conn., denied a motion on April 25 for the dismissal of a $9,000,000 damage suit brought by the Baush Machine Tool Company of Springfield, Mass., against the Aluminum Company of America, Pittsburgh, Pa.

The motion to dismiss was brought by the defendant on grounds of lack of jurisdiction, since neither party is a resident, inhabitant or citizen of the Connecticut district.

The Baush company claims damages of $3,000,000 on the charge that the Aluminum company has a monopoly and fixes prices of aluminum products similar to those sold by the Springfield company. Under the anti-trust laws treble damages are allowed provided the action is upheld.

Brass Ingot Business

The combined deliveries of brass and bronz ingots and billets by the members of the Non-Ferrous Ingot Metal Institute, Chicago, Ill., for March, 1932, amounted to 2,014 tons according to announcement by the Institute.

The average prices per pound received by the membership on commercial grades of six principal mixtures of ingot brass during the twenty-eight day period ending April 22 were as follows:

Commercial 80-10-10 (1% impurities)	7.022c
Commercial 78%	5.420c
Commercial 81%	5.755c
Commercial 83%	6.006c
Commercial 85-5-5-5	6.263c
Commercial No. 1 yellow	4.571c

On April 1st, unfilled orders for brass and bronze ingots and billets on the books of members amounted to a total of 19,245 net tons.

Remington Arms Concentrating Operations at Bridgeport

The Remington Arms-Union Metallic Cartridge Company, Waterbury, Conn., through its president, Saunders Norvell, has announced its plans of concentrating its business in Bridgeport, Conn. More than 50 officials will be obliged to establish their quarters in the Park City within the next month.

Bogus 'Chromium' Plate Hit by Trade Commission

Federal Trade Commission, Washington, D. C., has effected an agreement with the distributor of an alleged "plating" compound which is used for polishing metals, under which the seller will henceforth desist from using the word "chromium" or "Kwickrome," or any other term tending toward the misrepresentation of the material by implying or saying it is a means of producing a plated finish. The use of the terms "plating" and "plate" to imply a capacity to plate is also forbidden under the agreement.

Corporation Reports

Profits

Net profits or incomes reported by nonferrous metal, finishing and concerns in allied lines last month were as follows:

Anaconda Wire and Cable Company, New York: $18,680 for 1931, against $278,992 for 1930.

Gorham Manufacturing Company, Providence, R. I.: $29,814 for 1931, against $112,731 for 1930.

Aluminum Company of America, Pittsburgh, Pa.: $4,595,362 for 1931, against $11,672,726 for 1930.

British Aluminum Company, Ltd., England: £112,428 for 1931, against £133,549 for 1930.

Wolverine Tube Company, Detroit, Mich.: $156,833, against $3,670 net loss for 1930.

Losses

Net losses or deficits for 1931 were reported as follows:

Anaconda Copper Mining Company, New York: $3,151,726 for 1931, against $18,782,968 net profit for 1930.

Art Metal Works, Inc., Newark, N. J. (subsidiaries not included): $149,380, against $211,496 consolidated net profit for 1930.

Colt's Patent Fire Arms Company, Hartford, Conn.: $56,971, against $103,059 net profit for 1930.

Evans-Wallower Lead Company, Charleston, W. Va.: $319,312 (before $14,878 credit for accounts receivable and other income), against $669,661 net loss for 1930.

Morrison Brass Corporation, Ltd., Canada: $203,070, against $125,709 net profit for 1930.

Remington Arms Company, Inc., New York: $626,417, against $1,169,879 net profit for 1930.

Segal Lock and Hardware Company, Inc., New York: $138,487, against $201,907 net profit for 1930.

Yale and Towne Manufacturing Company, Stamford, Conn.: $726,250, against $296,931 net loss for 1930.

News From Metal Industry Correspondents

New England States

Waterbury, Connecticut

MAY 1, 1932.

Langdon H. Roper of New York and Stamford was elected president and general manager of the **Waterbury Clock Company,** succeeding **William H. White,** who has held the office only temporarily since the death of C. W. Curtiss. **L. Allen Osborn, Jr.,** of Bronxville, N. Y., was elected executive vice-president and treasurer. **George A. Close** remains as secretary.

All officers and directors of the **American Brass Company** were reelected last month.

All officers and directors of the **Scovill Manufacturing Company** were reelected last month.

Although the watch department of the **Waterbury Clock Company** was shut down for two weeks last month, some of the other departments were reported working seven days a week, nine hours a day. The company has again put out the $1 Ingersoll watch, cutting the price from $1.50. It is also putting out an electric clock to retail for $1.49, and has received an order for 75,000 of them from a chain store system.

Supposedly as a result of the **Anaconda Copper Mining Company's** report showing a net loss of $3,151,726 last year, the **American Brass Company** has made many adjustments involving salary reductions and reduction of personnel, particularly in its offices. In some cases, office men have been transferred to factory work.

The Waterbury secretary of the United States Civil Service Commission has notified local brass workers of the examination for rollers of brass and copper to fill vacancies in the navy yard. The pay is from $5.28 to $6.08 a day.

As a result of the renewed attempt to write a tariff on copper into the tax bill, **Rep. E. W. Goss** of this city held a conference in New York last month with the leading brass manufacturers of this section. Most have agreed that if a tariff is laid on copper there must be a compensating extra tariff on brass and brass goods. —W. R. B.

Connecticut Notes

MAY 1, 1932.

Hartford—Colt's Patent Fire Arms Company has developed a new flexible brake lining for automobiles. **President Samuel Stone** of the company reports that the machine gun division is busy on an order from the government for regular machine guns and for a new light aircraft gun. Business in the electrical division was much smaller last year, due to the slump in building operations. There was $54,202 profit for the year, after depreciation and taxes. A reserve of $100,000 was set up by a transfer from surplus to provide for possible anticipated losses. Most of the dividends were paid from surplus. All officers and directors of the company were reelected at the annual meeting last month.

Underwood - Elliott - Fisher Company earnings for the first quarter of this year amounted to $49,450, compared with $705,600 for the same period in 1931, equivalent to less than 1 cent a share.

Bridgeport—Remington Arms Company had a net loss of $1,173,045 for 1931 after depreciation, interest, amortization and after deducting $626,417 for inventory write-offs and an adjustment of $81,716 for foreign deposits and investments. In addition, there was a net loss of $5,245,278 on sale of cash register assets, including loss from operations during the year and a write-off of $61,015 for unamortized balance of development expenses. It had a net profit in 1930 of $1,169,879. The company plans to eliminate the 50,000 shares $100 par 8 per cent second preferred stock, on which there are accrued dividends of $50 a share. Exchanges of 10 shares of common for each share of the second preferred, including accrued dividends, are being made.

Meriden—Manning Bowman Company has developed a new electric food mixer and brought it up to the production stage. The plant is operating with a full working force on full time schedules, and business is said to be at its best for any time since 1926.

Bradley and Hubbard Company has elected **Robert J. Walker** vice-president and general manager. All other officers of the company were reelected at the annual meeting last month.

Bristol—E. Ingraham Company has increased production on a new line of wrist watches to sell for $5, and output averages about 3,000 daily. The company now manufactures its own motors for its electric clocks. In some departments production is behind orders.

Sessions Clock Company has adapted the use of "Coltrock," a product of the **Colt's Patent Fire Arms Company,** to clock cases. It is said to preserve the lubricant in the works. It is now manufacturing electric clocks with chimes and time gongs. Its line of Westminster chime clocks may now be had with electric or spring motors.

Torrington—At the **American Brass Company** and the **Union Hardware Company** some readjustment is in progress involving laying off single men where it is necessary in order to keep married men at work. In some cases the single men are put on reduced time, while the married men are given full time or as nearly that as possible.

Winsted—Homer Strong, president of the **Strong Manufacturing Company,** manufacturers of casket hardware, denies reports that the company is planning to move from the city. The plant was established 50 years ago.

Stamford—Yale and Towne Manufacturing Company reports a net loss of $726,250 for last year, after depreciation, against a loss of $296,000 in 1930 and a profit in 1929 of $2,585,600. Dividends of $851,648 were paid last year.

Terryville—Suit for $1,500 has been brought against the **Eagle Lock Company** by Mrs. Annie Tilbert of Bristol.

Naugatuck—The **Risdon Manufacturing Company** has started production on a line of moving picture cameras called "Ansco-Risdon."

Chester—Russell Jennings Manufacturing Company, manufacturers of augers, bits, etc., has closed its plant indefinitely. **C. J. Bates and Son,** manufacturers of novelties, is operating on reduced schedules. —W. R. B.

American Brass Company Re-Elects Officers

American Brass Company, Waterbury, Conn., Anaconda subsidiary, held a stockholders' meeting last month, re-electing John A. Coe president. Other officers elected are: Clifford F. Hollister, vice-president; Clark S. Judd, second vice-president; Clifford Hollister, treasurer; S. Burnham Terry, assistant treasurer; Edwin J. Rockwell, assistant treasurer; Clifford F. Hollister, secretary and Edwin J. Rockwell, assistant secretary.

Western Massachusetts

MAY 1, 1932.

Decided improvement was noted in employment conditions in Western Massachusetts industries over the past month. Although many firms have found it necessary to cut wages, they have retained, and in some cases increased, their staffs during this period. During May, it is expected, the number of men employed in the 26 metal working plants in this section of the state will show even further increases.

Rolls-Royce of America reports increased interest in the new models and expects orders for machines will show a slight upward trend.

Thermatrol Manufacturing Company reports a heavy schedule in production of a new safety blade sharpener and production of a special hinge at the rate of 150,000 per month is expected to start during the early part of the month. Orders for backs of clocks for a large Connecticut concern have increased somewhat.

President Charles C. Ramsdell of the

Gilbert and Barker Company is uncertain over prospects for the future, but reports the number of men employed at the plant is double what it was at the first of January.

Greatly increased orders at the **United-American Bosch** plant are reported because of production of the new Ford car. High grade ignition systems are being produced at the plant in greatly increased numbers, according to **President Arthur T. Murray.**

Both the **Baush Machine Tool Company** and the **Van Norman Machine Tool Company** are increasing their output because of increased activity at the Ford plants. The former company is producing multiple spindle drills for the automotive industry.

Tool and die plants throughout the section report great increases in business, and one firm has been employing both night and day shifts.

—G. B. Y.

Middle Atlantic States

Central New York

MAY 1, 1932.

Slight improvement in the metal trades in Utica is reported here by the Industrial Association. Figures completed for March show a five per cent increase in employes and 1.9 per cent increase in hours worked.

At the Ilion Engineers Club April meeting in the Remington Arms auditorium, **Robert T. Kent,** general sales manager of **Divine Brothers Company,** Utica, spoke on "The Fundamentals of Polishing Practice." Demonstrations with special shaped wheels followed.

Announcement was made April 18 by **President Sanders Norvell** of **Remington Arms Company** that **William A. Tobler,** recently elected vice-president, has been appointed general manager of all divisions and will report to the president. Mr. Tobler's headquarters will be in Bridgeport, Conn. **George Pinckney,** sales manager, who has lived in Ilion for the past five years, will be transferred to Bridgeport.

Remington Rand, Inc., has consummated a reciprocal technical contract with **Weilwerke,** makers of standard and portable typewriters and accounting machines in Frankfurt, Germany, under which certain products and patents of each become available to the other. Remington Rand has obtained a financial interest in the German concern. **John A. Zellers,** vice-president and general manager of the Remington typewriter division of Remington Rand, says the German management will not be changed. It is planned to increase the line of products in Germany and expand its markets there.

C. R. K. Corporation will manufacture hardware specialties in Frankfort, N. Y., in June, according to **Edward Durrell,** Columbus, Ohio. The new firm, which Mr. Durrell says is a combination of three firms formerly making hardware specialties, will locate in the vacant buildings in the Union Fork and Hoe system.

William F. Bossert, Utica, founder of the **Bossert Corporation** and now interested in the Signal Accessories Company, celebrated his 84th birthday April 17. Forty years ago Mr. Bossert started an electrical insulation manufacturing plant here and many of the larger buildings in the city were wired by his concern.

J. Spencer Drake, general manager of the **Drake Tractor and Equipment Company,** Rome, died from injuries received in a motor crash last month.

George L. Brunner of **Brunner Manufacturing Company,** Utica, reports the firm's new line of refrigerators and refrigeration units are selling well, and factory is working night and day shifts.

American Emblem Company, Utica, is branching out with a counter display stand, and reports that emblem business is up to standard.

Savage Arms Corporation is reported to be at work on a new type of washing machine, which will be ready for the trade soon. Plant officials decline to comment on this. —E. K. B.

Trenton, New Jersey

MAY 1, 1932.

Trenton metal concerns have not experienced much revival in business. Some companies are laying off help; others have reduced working hours. **Trenton Brass and Machine Company** laid off some help during the past month; also **John A. Roebling's Sons Company.**

Six independent packing companies of New Jersey recently brought action in the Court of Chancery against the **American Can Company** to recover what they described as losses caused by what they call "fraudulent practices" of the can concern. The New Jersey concerns charged the can company induced them to enter long-term contracts whereby can prices would change in accordance with "official prices of tin bearing little or no relationship to the actual market prices." They also charge they were discriminated against in favor of larger concerns, and that the can company violated pledges that prices to all customers would be the same regardless of the quantities purchased.

Titanium Pigment Company, New York, a subsidiary of the **National Lead Company,** announces that it will erect a new plant along the Raritan River, near South Amboy, to employ about 500 hands, and to cost about $2,000,000 for buildings and equipment. Representatives of the lead company have spent some time in South Amboy seeking information on tax rates and other matters.

Following concern has been chartered at Trenton: **J. Holdberg, Inc.;** $25,000; metals; Perth Amboy. —C. A. L.

Pressed Leather Wheel Company Reorganized

Pressed Leather Wheel Company, Little Falls, N. Y., announces that the agreement between that firm and Divine Brothers Company, Utica, N. Y., has been dissolved by mutual consent. William Peterson, for the past three years metal finishing engineer with the Divine company, will reorganize and be president of the Pressed Leather Wheel Company, which will again manufacture the Cheney patent metal finishing wheel and other types of polishing wheels. Factory of the Henry Cheney Hammer Corporation, Little Falls, will be used.

Newark, New Jersey

MAY 1, 1932.

Radio Products Corporation, 548 South Eleventh Street, expects to start mass production shortly on a new type tiny radio receiving set for which it holds the exclusive patent. A national merchandising organization has contracted to distribute 1,000,000 of the new sets within the next year. The firm is a subsidiary of **Television, Inc.,** which holds the patent mentioned. Ten inches high and six inches wide, each set will have an electric clock in its front frame, above the reception controls. The largest sets will get round-the-world transmission, it is claimed. The Newark factory will be mainly for assembly. It is estimated that, in addition to the 1,000 men employed, at least 1,000 will be employed in other factories making cabinets, clocks and wire parts for the sets. The tubes will be manufactured here.

William G. Ahrendt, silversmith and goldsmith, who operated a plant at 105 Rose Street, Newark, died suddenly recently of a heart attack at his home, 545 Alden Avenue, Westfield, N. J. He was 48 years old and a former resident of Newark. He was a member of the Traveling Jewelers' Association.

Hoyt Brothers, Inc., 100 Shipman Street, will erect an industrial chemical manufacturing plant; 7 stories, 55 by 80.

Following Newark concerns have been incorporated: **Durable Luminous Tubing Company, Inc.,** 500 shares, to manufacture luminous tubing; **Ogden Machinery Corporation,** 1,000 shares, brass founders and metal workers; **Tru-Lite Electric Lamp Company,** $135,000, manufacture electric lamps; **Hagerstrom and Son, Inc.,** $125,000, manufacture jewelry; **Sonolux Company,** 2,500 shares, manufacture electric fixtures; **Larter and Sons,** $300,000 preferred, 500 shares common; jewelry.

Harry G. Hendricks, removed co-receiver of the **Earl Radio Corporation,** is under $30,000 bail for the grand jury on the charge of embezzling receivership funds. He is held in an additional $25,000 bail on a writ of attachment issued by Vice-Chancellor Church. Hendricks, who had been missing for more than a week since he was removed as a co-receiver of the radio company, following discovery of an alleged shortage of $185,000 in his accounts, later surrendered. —C. A. L.

Middle Western States

Detroit, Michigan

MAY 1, 1932.

It has been a slow month for industry in every line, and especially so in non-ferrous metals. The last few days of March brought some improvement, due to the drive to get the motor car production back again. This, however, was not of long duration, and before the middle of April conditions slumped back again until at present there is not much more activity than there was in February, which was extremely dull. Manufacturers of motor cars are now in low production. This is the period of the year when they should be at their best.

Platers are dragging along, although for a time earlier in the month they showed signs of more activity. Never in the history of the industrial centers along the Great Lakes have conditions been so quiet as they are at this writing. There seems absolutely nothing at this time on which to base any kind of an encouraging forecast for the immediate future.

Hammond Aircraft Corporation, newly chartered in Michigan, has selected Ann Arbor as the base of its operations, and has taken possession of a factory building on North Main street in that city. Announcement of the company's organization is made by **Dean B. Hammond,** president and general manager. Associated with Mr. Hammond are his father, **B. D. Hammond,** of Detroit, and **Erwin F. Stocdapole,** who for several years was operations manager and a pilot for the Flo Flying Services, Inc., which manages the Ann Arbor Municipal Airport.

Ford Motor Company recently awarded contract for hot metal equipment, including cars and ladles, to the **William P. Pollock Company** at Youngstown, O.

The extensive welding work which has been done by the **Northern Engineering Works,** Detroit, in connection with the manufacture of cranes and electric hoists, has developed into the establishment of a "weldry" division, equipped to design and produce a wide variety of welding products. The facilities of an experienced engineering, designing and layout department are available.

"Sparton" refrigerators are now being manufactured at the **Sparks-Withington Company,** near Michigan Center, Mich. According to company executives there are 1,250 persons on the payrolls. Along with the rest of the refrigeration industry, the Sparks Withington Company is preparing for the peak season, which comes in spring and early summer.

Auto Specialties Manufacturing Company, St. Joseph, Mich., has speeded up production for spring. Orders presumably from Ford have put 300 men at work, and there are prospects for full production soon which will require 750 to 900 men, it is stated.

C. W. Miller, formerly vice-president and general manager of **Wilcox-Rich Corporation,** was elected president at an organization meeting in Detroit recently, following a stockholders' meeting. Mr. Miller succeeds **C. I. Ochs,** who becomes vice-president. **F. A. Buchda** was re-elected secretary and treasurer, with **E. M. Boyle** as assistant treasurer and **D. G. Crawford** as assistant secretary. All the directors were re-elected.

Stinson Aircraft Corporation, division of Cord Corporation, built and sold nearly 53 per cent of all cabin monoplanes manufactured in the United States during 1931, according to figures of the United States Department of Commerce. W. R. B.

Wisconsin Notes

Hasco Valve and Machine Company has been formed in Milwaukee by **H. A. Schauer,** with the manufacturing division of the **B. Hoffmann Manufacturing Company** as the nucleus. Mr. Schauer recently purchased the Hoffmann division, and will continue production of valves and fittings for power plants, paper mills and the chemical industry, and chrome nickel steel valves. In the near future Hasco will bring out a line of chrome nickel steel dairy fittings.

Super-Steel Products Company, Milwaukee, has developed a new extruded aluminum skylight, according to **Charles Raschka,** engineer and vice-president. According to the company, this marks a decided forward trend in skylight construction. In 1868 a skylight was developed with ordinary sheet iron, the parts being riveted or soldered together, but since then, Super-Steel officials claim, no major improvements were made.

No change in the officers of the **Aluminum Goods Manufacturing Company,** Manitowoc and Two Rivers, was made at the annual stockholders' meeting held in New Jersey. —W. T. N.

Pacific Coast

LOS ANGELES, MAY 1, 1932.

Unemployment has led to a peculiar mining development in this region. Many people are prospecting in the old abandoned gold and silver camps, and some metal has been struck here and there, with most of the prospectors doing fairly well, averaging ten to twenty dollars a day. A few big strikes have been made. Deep mining is expensive, so most of these people go in for placer mining on the surface, or they blast out rock and have it ground up at the smelters. Demand for tools has improved in consequence.

Pacific Coast and Rocky Mountain states are all in favor of a copper tariff to protect the American producers from foreign metal. The governors as well as a number of commerce chambers, state mines divisions, Better Business Bureaus, etc., are working for the tariff.

California Institute of Technology, Pasadena, has developed a new platinum fog method of coating large telescope mirrors. The process involves evaporation of the metal at high temperature and depositing atoms of it on the mirror base.

The new **Chrysler** automobile factory now under construction at Los Angeles, will cost $2,000,000. Improved finishing equipment of many types will be installed, including ovens, co-ordinated conveyors, cold rust-proofing processes, plating equipment and all facilities for manufacture, finishing, assembly and shipment of 200 cars a day. Architecture of all buildings will be Spanish. **Fred W. Zeder,** vice-president, is engineer in charge.

There has recently been considerable talk of establishing a tin smelter in Los Angeles, to take care of Bolivian tin mine production.

William Benbow and Company, 1605 South Arlington Avenue, Los Angeles, claims to be about the only firm in America making exact reproductions of Sheffield plate. The same methods originally used in production of Sheffield are said to be used, including sweating of silver to copper base, intricate hand working of sterling silver, etc.

'Zephyr" air cleaning system for buildings has been on exhibition at Architects Building, Los Angeles. The equipment is made entirely of brass and copper. The maker is located at Minneapolis Minn.

Adjusto Equipment Company, 973 North Main Street, Los Angeles, is producing an aluminum motor for small boats. Company is also working on a new type of display sign, to be made of brass, bronze and aluminum.

J. D. Ehl Company, Los Angeles, will open a new plant at Gardina, to make electric fixtures and novelties.

Stalder Manufacturing Company, 332 Venice Boulevard, Los Angeles, produces chromium plated and art craft work.

E. S. Chapman, head of **Amplex Manufacturing Company,** Los Angeles, a division of Chrysler, says his firm will make marine and industrial motors, bronze bearings, bushings, etc.

Enterprise Oil Burners, Inc., 405 Dexter Avenue, Seattle, Wash., is going into production.

O'Keefe-Merritt Company, Los Angeles, manufacturer of ranges, heaters, electric refrigerators, etc., has opened a branch at San Francisco.

Pioneer Novelty Manufacturing Company, 86 Third Street, San Francisco, is producing coin operated amusement devices.

Electric Products Corporation, 950 30th Street, Oakland, will erect a new plant at 12th and Market Streets, San Franciso.

Foster Manufacturing Company, lacquer manufacturers, will operate at 2022 Sacramento Street, Los Angeles.

Oro Products Company, auto headlights, has been organized at 2903 San Pablo Avenue, Berkeley, in charge of **C. Van Duzee** and **R. J. Ward.**

Truway Corporation will manufacture feed valves at 1177 Howard Street, San Francisco; managed by **Joseph Nathanson.**

Fourness Development Company, 152 Fremond Street, San Francisco, is actively manufacturing refrigeration equipment for trucks. **Joseph Poretti and Son,** Oakland, is also in this line of business. Others in this business are **Nectar Vehicle Refrigeration Company,** 3614 Telegraph Avenue, Oakland; in Los Angeles are **Drayer and Hanson; Yankee Body Works.** H. S.

Other Countries

Birmingham, England

APRIL 18, 1932.

During the last month there has been acute weakness in the copper market. Demand has remained at a low level. At the non-ferrous rolling mills in the Birmingham district the flow of business is retarded by the weakness of copper, which in its turn is due partly to the exchange position and partly to the existence of huge stocks in America. Manufacturers of tubes are able to book contracts, but it is a very different thing to persuade customers to take delivery.

Trade in cutlery and plate in Sheffield is poor.

Aluminum hollow-ware trade continues busy, and this year has again seen the introduction of many new designs. The policy of many manufacturers in Birmingham and the Midlands is to produce superior and medium grades, but during the last year or two a limited number of makers have put on the market hollow-ware of very thin gauge in order, no doubt, to match low priced foreign products. This ware, however, has found its way to some English shops, and as a result of the disappointment caused to users arising from lack of durability, public attention has been diverted to wrought enamel ware. The popularity of high quality aluminum goods is beyond question, and more manufacturers are devoting attention to production of utensils for electric cooking. These are provided with extra heavy gauge bottoms which are ground flat in order to make perfect contact with the hot plate. The outlook in this line is considered promising.

Builders' cast brass goods have been selling rather slowly, but there are signs of gradual improvement in building, and a bigger demand is expected with approach of better weather. Chromium plating in the bathroom is gaining popularity, and many fittings used in housing schemes specify chromium. J. A. H.

Business Items—Verified

United Metal Manufacturing Company, Norwich, Conn., is in temporary receivership under James E. McCormick.

Watson Manufacturing Company, Jamestown, N. Y., producer of metal furniture and screening, is in receivership.

Joseph Dixon Crucible Company, Jersey City, N. J., reported total assets of $10,683,614 as of December 31, 1931, against $10,683,614 at end of 1930.

United Engineering and Foundry Company announces that since April 25 its offices have been located in the First National Bank Building, Pittsburgh, Pa.

The "R. A." rough copper brand of the **Roan Antelope Copper Mines** has been added to the lists of brands which are good delivery on the Berlin Metal Exchange.

Amtorg Trading Corporation, New York, agent for the Soviet government, is handling the arrangements for construction of a second aluminum paint plant at Leningrad.

Joseph Waldman is now located at 359 Mulberry Street, New York, to engage in the manufacture of watch accessories and metal novelties, including lapel buttons made of aluminum.

Jennings Silver Company, Inc., Irvington, N. J., recently had a fire in its factory, and the damage was materially higher than first estimated. Normal operations have been resumed.

Aluminum Industries, Inc., Cincinnati, Ohio, has opened a new warehouse in Portland, Oregon, at 86 North 12th Street. It will be under the supervision of **R. E. McGill,** Pacific Coast district manager.

Diamond Metal Company, Inc., has been organized at Houston, Texas, to manufacture metal products. Capital stock, $25,000; incorporators: W. T. Touchton, R. B. McCaine, J. R. Cookenboo.

Strong Manufacturing Company, Sebring, Ohio, has been reorganized, and will resume operations at an early date. For the present, production will be confined to the manufacture of enamelware kitchen utensils and specialty enameled products.

Kron Company, formerly The American Kron Scale Company of New York, and now located in Bridgeport, Conn., manufacturers of industrial scales, has just appointed **George A. Nichols** as New York district manager. Mr. Nichols will be located at 801 Chrysler Building.

Pittsburgh Equitable Meter Company and **Merco Nordstrom Valve Company** are joining interests. Arrangements have been completed for the Pittsburgh company to acquire all the capital stock of Merco Nordstrom, and the latter will operate as a division of Pittsburgh Equitable.

Whitehead Metal Products Company of New York, Inc., recently invited a large number of New England plant executives, metallurgists, shop foremen, etc., to attend a welding demonstration and official housewarming at the new Whitehead Building, Lechmere Square, Cambridge, Mass.

General Bronze Corporation, New York, stockholders have approved change in common stock from no par to $5 par, and reduction of stated value from $10 to $5 a share, making possible a transfer of $2,877,800 from capital to capital surplus. Directorate was reduced from fourteen to eleven members.

Star Brass and Bronze Company, 1616 Fitzwater Street, Philadelphia, Pa., has been organized, to manufacture brass, bronze and aluminum castings. The members of this new company are **Harry A. Hartranft** and **Matthew Cairone,** who have had 25 years of service with the former Paul S. Reeves and Company, Inc., of Philadelphia.

Geometric Stamping Company, Cleveland, Ohio, has added another representative, **Dudley H. Smith,** 221 East 20th Street, Chicago, Ill. Mr. Smith enjoys wide acquaintance in his territory, has broad knowledge of industrial design and production, and will offer considerable service to users and prospective users of stampings.

Dust Recovering and Conveying Company, Cleveland, Ohio, has formed a foreign business department, and will license foreign makers to produce equipment from Dracco designs. An office has been established at 77 Rue des Tanneurs, Brussels, Belgium, under management of **Tevo, Ltd.,** engineers. **E. H. de Coningh** is foreign sales manager at Cleveland.

Kewaunee Manufacturing Company, Adrian, Mich., manufacturer of laboratory furniture and equipment, will concentrate on metal fixtures in the future, and production will soon begin on a complete line of metal furniture for science and home economic laboratories. This firm operates the following departments: cutting-up shop, stamping, and lacquering.

North Bergen Varnish Corporation, North Bergen, N. J., announces appointment of **Ben H. Focht** as western sales manager, with headquarters at Chicago. Chicago offices and warehouse are now located at 1500 South Western Avenue. Complete stocks of the various "Berco" finishing products will be carried. Associated with Mr. Focht are **J. E. Martin** and **E. L. Bracklow.**

F. L. and J. C. Codman Company, South Boston, Mass., large manufacturers of buffing and polishing wheels, announce that they have removed to new and larger quarters at Elkins Street, South Boston, Mass. With new and improved machinery and facilities, the company will be enabled to provide

even better service than heretofore, it is announced.

Wright Metal Company, Jamestown, N. Y., will continue in business, having received court authorization to do so, according to **Samuel J. Lasser,** assignee. Company, which manufactures metal partitions, etc., recently made assignment for benefit of creditors. Unfilled orders beginning of April were said to amount to $96,000. Negotiations are reported under way for complete reorganization.

Metals Coating Company of America, 495 North Third Street, Philadelphia, Pa., elected the following directors at its annual meeting: Richard L. Binder, E. Waring Wilson, James H. Gravell, George Ruck, Harry J. Alker, Jr., J. C. Merkel and Leopold Pessel. J. H. Gravell is president of the American Chemical Paint Company, Ambler, and George Ruck heads the Columbia Steel Equipment Company of this city.

Following its policy of extension, **Geometric Stamping Company,** Cleveland, Ohio, enters the Boston and Cincinnati-Dayton territories with the appointment of district representatives. **E. F. Wilmot** of the E. F. Wilmot Company, 62 Ridgemont St., Boston, will serve the company's customers in the Boston district and **H. A. Bell,** Third National Bank Building, Dayton, will be its representative in the Dayton-Cincinnati district.

Electric Furnace Company, Salem, Ohio, has purchased the business of the **Process Engineering and Equipment Corporation,** Attleboro, Mass., builders of "Preeco" bright annealing and controlled atmosphere furnaces. All equipment, etc., of the Process company has been moved to Salem, Ohio. The Electric Furnace Company specializes on large production electric and fuel fired furnaces and material handling equipment for use in connection with these furnaces.

Hartley Wire Die Company is now located in Waterville, Conn. It is engaged in the manufacture of fine dies for use in drawing wire, rod and tubes. The new quarters are in an idle section of the **Chase Metal Works** plant, which has been secured by lease. According to **Earle W. Hartley,** executive head of the concern, considerable expansion is planned in the next few months. The company was formerly located at Pierpont Heights, Conn., where it was organized in 1850.

Cramp Brass and Iron Foundries Company and the **Baldwin-Southwark Corporation,** Philadelphia, Pa., have sold the property known as the pipe shop of the old Cramp Shipyard, to **Wilson H. Lear.** It contains 475 feet on Dyott Street, 156 feet on Delaware Avenue, and 375 feet on Fletcher Street, and is assessed at $109,000. Wilson H. Lear will use the property in conjunction with his adjoining lumber yard on East Girard Avenue. The two companies selling the property are subsidiaries of the Baldwin Locomotive Works.

Metal Market Review

By R. J. HOUSTON

D. Houston and Company, Metal Brokers, New York

Copper

MAY 1, 1932.

Conditions in the copper market have varied but little lately. Prices continue to hover around the lowest recorded levels for all time. In the export market foreign consumers were buyers of moderate quantities at 6 to 6¼ cents c.i.f. European ports. There was noticeable hesitation on the part of domestic consumers to place new orders in what could be classed as really substantial tonnages. Supplies for the home trade have been available at 5¾ to 6 cents deliverable to Connecticut valley points. The bookings, however, for local and middle west deliveries were on a restricted scale.

There was an absence of aggressive selling which would seem to indicate that prices cannot stand any further pressure from any quarter. At present interest is focussed on the agitation for a tariff on copper imported into the United States. Opinion in the trade on the merits of the proposal is divided, as interest appears but the hopeful sign is that sentiment is overwhelmingly in favor of doing something concrete to help the copper industry. Obviously present doleful conditions cry aloud for remedial action either voluntary or legislative. The current operating rate is supposed to be around 20% of capacity. Adequate curtailment of output should have started two years ago. A close analysis of the situation demonstrates the fact that the law of supply and demand must be heeded at all times.

Zinc

The zinc market showed a steady undertone the first two weeks in April. During that time Prime Western sold in fair volume at 2.80c East St. Louis basis. Near the month-end, however, the market became easier and supplies were offered at 2.75c. Buyers were not particularly active even at the more favorable price. Latest statistics show that production and deliveries are almost evenly balanced. During the first three months of 1932, production totaled 66,525 tons and deliveries 66,916 tons. At the beginning of April, slab zinc stocks were 129,451 tons as compared with 141,493 tons one year ago. Further curtailment is under way, and a substantial reduction in smelters' stocks is expected to result from April operations.

Tin

Action of the tin market in April reflected weak and depressing developments both here and abroad. Straits tin was in supply during the first half of the month at the lowest price this year, or at 18.35 cents per pound. This compared with 20.25c at the beginning of April. Consumers confined buying to a restricted scale as necessities required and the unsettled conditions and active liquidation by foreign operators deterred local buyers, even at sharp recessions. Transactions in London on occasions were heavy followed by more quiet tone. Recent cable advices report a more bullish attitude in progress in the London market. Important developments are expected in producing circles which will definitely indicate a further decrease in output. American consumption of tin is much below the average in other years. Deliveries for first quarter of 1932 were 9,660 tons, against 18,430 tons for first quarter of 1931. A firmer tone prevails at this writing, with prompt Straits tin quoting 20¼ cents.

Lead

A good buying movement was noted in lead during April. Orders were well distributed amongst nearly all classes of consumers. Transactions make a rather favorable showing, and some interests have probably disposed of their full operating quota for April. Though demand has been so active prices remained at stationary levels of 3c New York and 2.90c St. Louis basis. Current low prices afford consumers every encouragement to cover all possible requirements. Domestic stocks on April 1 totaled 169,091 tons, an increase of 3,158 tons as compared with March 1. Present stocks are 38,665 tons larger than those a year ago. A radical reduction in surplus supplies would prove an important factor in the lead situation.

Aluminum

All positions for new aluminum continue steady. Demand is curtailed in all branches of industry where the metal is used. The market, however, shows a steady undertone and values for primary grades are without change. The best demand appears to be coming from the automotive industry, but requirements from this source are said to be specially for remelt material. The secondary smelting industry is reported to be handling most of the automobile demand at present.

Antimony

There was a very small movement of antimony on market transactions, although some scattered orders were covered. Nearby shipment values resumed a downward trend lately reflecting further weakness in offers from China. Chinese regulus 99% metal quotes 5.87½c duty paid which established a new low for this year. In fact it is the lowest price since 1922 when 4.15c was touched. Comparatively little buying interest was displayed, and tendency was for values to ease.

Quicksilver

In the local market quicksilver is quoted at $73 to $73.50 per flask. The position is less firm than a few weeks ago, with inquiry and buying interest limited.

Platinum

There is no special activity reported in this article. Price continues to quote $37.50 per ounce for refined platinum.

Silver

Trading prices for silver have settled down to a relatively narrow range. The market, however, is therefore more stable and less unsettled than it was months ago. Professional and speculative dealings were active on the local metal Exchange lately, but developments have been disappointing to those who banked upon an international program to deal with the silver problem. It is most difficult to secure that co-operation among governments necessary to achieve stabilization of values on a sound basis. Concentration of interest and effort, however, continues along these lines, with the object of bringing Mexico, the United States, Canada and Australia into some sort of agreement for solving and overcoming the difficulties of the situation. These four countries are the principal producers, and should be in position to lead in some scheme of remedial action.

Old Metals

The market for secondary metals continues to feel the pressure of low prices resulting from depressed conditions in primary markets. Considerable business was done in copper and brass grades for shipment abroad. Export inquiry for this material was in substantial volume, but shippers had to be satisfied with low prices. The European outlet afforded about the only opportunity for trading on a fairly large scale as domestic consumers were apathetic even at current quotations. Demand for heavy lead was in fair volume, and zinc and aluminum came in for a moderate share of the demand.

The Wrought Metal Business

By J. J. WHITEHEAD

President, Whitehead Metal Products Company of New York, Inc.

MAY 1, 1932.

The peaks and valleys are gradually being worked out, and ultimately we will be working on a stabilized rate of production and consumption. Needless to say, a balance will exist or will have to exist before great forward progress may be expected.

It is believed that we can expect favorable developments early in June or in the Fall. Oil is up, silver is holding very steady, sugar is steadying, and many other commodities are fluctuating only within a very narrow range. Bank failures have virtually ceased, hoarding is a thing of the past, and, most important of all, a new spirit of confidence is around. Considerable adjustment is still necessary to take care of industrial concerns that are in a bad way. Possible receiverships will act as a dampener every once in a while.

The wrought metal business has been thoroughly adjusted to the general trend of average business. Its expansion or further contraction is dependent from now on, on general business improvement.

The electrical industry is bound to expand during future years at an unprecedented rate. The public utility companies are being formed into tremendous units. Lower cost of power and light is assured. This means copper not only for the actual carrying of the current but for the many articles that will use this current. In this field alone the use of copper and its alloys, and also other metals, assures for the coming years a gigantic outlet.

Individual companies are developing alloys that are being marketed under trade names and which have exceptional properties. For instance "Everdur" has all or more than the corrosion resisting virtues of copper and at the same time the strength of steel.

Not only the copper and brass mills, but nickel and Monel and aluminum are all marking time. The forces of the respective companies interested in these metals are, it is believed, developing many new uses and improving their products so as to make them more suitable for the existing markets. Times such as those through which we are passing have always resulted in the development of a lot of new ideas about the use of metals, and it is hardly to be expected that this period is going to prove any exception.

The general consensus of opinion plainly indicates that the future of the metal business, when present difficulties are past, is going to be very bright. There is every reason to believe that the world will use more metal than ever before. Until the happy days of an active demand for metal are here again we will all have to make the best of it and keep a-working.

Daily Metal Prices for the Month of April, 1932

Record of Daily, Highest, Lowest and Average Prices and the Customs Duties

	1	4	5	6	7	8	11	12	13	14	15	18
Copper c/lb. Duty Free												
Lake (Del.)	6.125	6.125	6.125	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	5.875
Electrolytic (f.a.s. N. Y.)	6.00	6.00	6.00	5.875	5.875	5.875	5.875	5.875	5.875	5.875	5.875	6.00
Casting (f.o.b. ref.)	5.75	5.75	5.75	5.625	5.625	5.625	5.625	5.625	5.50	5.50	5.50	5.50
Zinc (f.o.b. St. L.) c/lb. Duty 1¼c/lb.												
Prime Western	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80
Brass Special	2.90	2.90	2.90	2.90	2.90	2.90	2.90	2.90	2.90	2.90	2.90	2.90
Tin (f.o.b. N. Y.) c/lb. Duty Free												
Straits	20.25	19.50	19.60	19.25	19.25	18.75	18.50	18.50	18.50	18.35	18.60	19.00
Pig 99%	19.50	18.75	19.00	18.625	18.625	18.125	17.75	17.875	17.875	17.75	18.00	18.375
Lead (f.o.b. St. L.) c/lb. Duty 2¼c/lb.	2.90	2.90	2.90	2.90	2.90	2.90	2.90	2.90	2.90	2.90	2.90	2.90
Aluminum c/lb. Duty 4c/lb	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30
Nickel c/lb. Duty 3c/lb.												
Electrolytic 99.9%	35	35	35	35	35	35	35	35	35	35	35	35
Shot (from remelted electrolytic)	36	36	36	36	36	36	35	36	36	36	36	36
Pellets 99.5-100%	40	40	40	40	40	40	40	40	40	40	40	40
Antimony (Ch. 99%) c/lb. Duty 2c/lb	6.125	6.10	6.10	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	5.95
Silver c/oz. Troy Duty Free	29.625	29.125	29.00	28.75	28.375	28.375	28.50	28.25	28.00	27.875	28.25	28.25
Platinum $/oz. Troy Duty Free	37.50	37.50	37.50	37.50	37.50	37.50	37.50	37.50	37.50	37.50	37.50	37.50

	19	20	21	22	25	26	27	28	29	High	Low	Aver.
Copper c/lb. Duty Free												
Lake (Del.)	5.875	5.875	5.875	5.875	5.875	5.875	5.875	5.875	5.875	6.125	5.875	5.958
Electrolytic (f.a.s. N. Y.)	5.875	5.75	5.75	5.75	5.75	5.75	5.75	5.75	5.75	6.00	5.75	5.851
Casting (f.o.b. ref.)	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.75	5.50	5.565
Zinc (f.o.b. St. L.) c/lb. Duty 1¼c/lb.												
Prime Western	2.80	2.75	2.75	2.65	2.625	2.625	2.60	2.60	2.60	2.80	2.60	2.743
Brass Special	2.90	2.85	2.85	2.75	2.75	2.75	2.75	2.75	2.75	2.90	2.75	2.852
Tin (f.o.b. N. Y.) c/lb. Duty Free												
Straits	18.90	19.375	20.25	19.75	20.10	19.70	19.50	19.45	19.00	20.25	18.35	19.242
Pig 99%	18.25	18.75	18.75	18.75	19.50	19.50	19.50	19.50	18.50	19.50	17.75	18.631
Lead (f.o.b. St. L.) c/lb. Duty 2¼c/lb.	2.90	2.90	2.90	2.90	2.90	2.90	2.90	2.90	2.90	2.90	2.90	2.90
Aluminum c/lb. Duty 4c/lb	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30
Nickel c/lb. Duty 3c/lb.												
Electrolytic 99.9%	35	35	35	35	35	35	35	35	35	35	35	35
Shot (from remelted electroyltic)	36	36	36	36	36	36	36	36	36	36	36	36
Pellets 99.5-100%	40	40	40	40	40	40	40	40	40	40	40	40
Antimony (Ch. 99%) c/lb. Duty 2c/lb	5.875	5.875	5.875	5.65	5.35	5.35	5.35	5.35	5.35	6.125	5.35	5.824
Silver c/oz. Troy Duty Free	28.125	28.125	28.375	28.375	28.00	28.00	27.875	27.50	27.375	29.625	27.375	28.292
Platinum $/oz. Troy Duty Free	37.50	37.50	37.50	37.50	37.50	37.50	37.50	37.50	37.50	37.50	37.50	37.50

Metal Prices, May 2, 1932

(Duties mentioned refer to U. S. tariffs on imports, as given in the Tariff Act of 1930.)

NEW METALS

Copper: Lake, 5.875. Electrolytic, 5.625. Casting, 5.50.
Zinc: Prime Western, 2.55. Brass Special 2.65.
Tin: Straits, 20.00. Pig, 99%, 1940.
Lead: 2.90. **Aluminum,** 23.30. **Antimony,** 5.35.
Nickel: Ingot, 35. Shot, 36. Elec., 35. Pellets, 40.
Quicksilver: flask, 75 lbs., $72. **Bismuth,** 85.
Cadmium, 55. **Cobalt,** 97%, $2.50. **Silver,** oz., Troy (N. Y. official price May 4) 27.125.
Gold: oz., Troy, $20.67. **Platinum,** oz., Troy, $37.50 to $40.00.

Duties: Copper, free; zinc, 1¼c. lb.; tin, free; lead, 2½c. lb.; nickel, 3c. lb.; quicksilver, 25c. lb.; bismuth, 7½%; cadmium, 15c. lb.; cobalt, free; silver, free; gold, free; platinum, free.

INGOT METALS AND ALLOYS

	Cents lb.	Duty
Brass Ingots, Yellow	4½ to 6½	45%
Brass Ingots, Red	6¼ to 7⅜	45%
Bronze Ingots	7 to 9	45%
Aluminum Casting Alloys	19 to22	4c. lb.
Manganese Bronze Castings	18 to35	45%
Manganese Bronze Ingots	6 to10	45%
Manganese Bronze Forgings	26 to35	45%
Manganese Copper, 30%	17 to25	25%
Monel Metal Shot or Blocks	28	25%
Phosphor Bronze Ingots	7¼to10	45%
Phosphor Copper, guaranteed 15%	10 to15	3c. lb.
Phosphor Copper, guaranteed 10%	9½to14	3c. lb.
Phosphor Tin, no guarantee	25 to37	Free
Silicon Copper, 10%	17 to35	45%
Iridium Platinum, 5%	$42.00	Free
Iridium Platinum, 10%	$44.00	Free

OLD METALS

Dealers' buying prices, wholesale quantities	Cents lb.	Duty
Heavy copper and wire, mixed	3⅞to 4⅛	Free
Light copper	3⅛to 3⅜	Free
Heavy yellow brass	2 to 2⅛	Free
Light brass	1½to 1¾	Free
No. 1 composition	2¾to 3	Free
Composition turnings	2⅝to 2⅞	Free
Heavy soft lead	2 to 2¼	2⅛c. lb.
Old zinc	1 to 1⅛	1½c. lb.
New zinc clips	1½to 1¾	1½c. lb.
Aluminum clips (new, soft)	11 to12	4c. lb.
Scrap aluminum, cast, mixed	3½to 3¾	4c. lb.
Scrap aluminum sheet (old)	8½to 9	4c. lb.
No. 1 pewter	10½to11	Free
Electrotype and Linotype	1⅞to 2¼	2½c. lb.*
Nickel anodes	20¼to22¼	10%
Nickel sheet clips; rod ends (new)	23¼to24¼	10%
Monel scrap	6 to 9	3c. lb.

* On lead content.

Wrought Metals and Alloys

The following are net BASE PRICES per pound, to which must be added extras for size, shape, small quantity, packing, etc., as shown in manufacturers' price lists, effective February 25, 1932.

COPPER MATERIAL

	Net base per lb.	Duty
Sheet, hot rolled	15⅜c.	2⅛c. lb.
Bare wire	8½c.	25%
Seamless tubing	14⅞c.	7c. lb.
Soldering coppers	15⅞c.	45%

NICKEL SILVER (NICKELENE)

Net base prices per lb. (Duty 30% ad valorem.)

Grade "A" Sheet Metal		Wire and Rod	
10% Quality	21c.	10% Quality	24½c.
15% Quality	23¼c.	15% Quality	28⅛c.
18% Quality	24½c.	18% Quality	31⅝c.

BRASS MATERIAL—MILL SHIPMENTS

Net base prices per pound

Net per lb.	High Brass	Low Brass	Bronze	Duty
Sheet	12½c.	13⅝c.	14c.	4c. lb.
Wire	12½c.	13⅝c.	14c.	25%
Rod	10¼c.	13⅝c.	14c.	4c. lb.
Brazed tubing	21⅝c.		24⅝c.	12c. lb.
Open seam tubing	20¼c.		21¾c.	25%
Angles, channels	20¼c.		21¾c.	12c. lb.
Seamless tubing	15¾c.		17⅛c.	8c. lb.

TOBIN BRONZE AND MUNTZ METAL

Net base prices per pound. (Duty 4c. lb.)	
Tobin Bronze Rod	14c.
Muntz or Yellow Metal Sheathing (14"x18")	14⅝c.
Muntz or Yellow Rectangular sheet other sheathing	14⅝c.
Muntz or Yellow Metal Rod	11¼c.

ALUMINUM SHEET AND COIL

(Duty 7c. per lb.)

Aluminum sheet, 18 ga., base, ton lots, per lb.	32.30
Aluminum coils, 24 ga., base price	30.00

ROLLED NICKEL SHEET AND ROD

(Duty 25% ad valorem, plus 10% if cold worked.)

Net Base Prices

Cold Drawn Rods	50c.	Cold Rolled Sheet	60c.
Hot Rolled Rods	45c.	Full Finished Sheet	52c.

MONEL METAL SHEET AND ROD

(Duty 25% ad valorem, plus 10% if cold worked.)

Hot Rolled Rods (base)	35	Full Finished Sheets (base)	42
Cold Drawn Rods (base)	40	Cold Rolled Sheets (base)	50

SILVER SHEET

Rolled sterling silver (May 4) 30.25c. per Troy oz. upward, according to quantity. (Duty free.)

ZINC AND LEAD SHEET

	Cents per lb. Net Base	Duty
Zinc sheet, carload lots, standard sizes and gauges, at mill, less 7 per cent discount	9.00	2c. lb.
Zinc sheet, full casks (jobbers' price)	9.25	2c. lb.
Zinc sheet, open casks (jobbers' price)	10.00to10.25	2c. lb.
Full Lead Sheet (base price)	6.25	2⅜c. lb.
Cut Lead Sheet (base price)	6.50	2⅜c. lb.

BLOCK TIN AND BRITANNIA METAL SHEET

(Duty free)

This list applies to either block tin or No. 1 Britannia Metal Sheet, No. 23 B. & S. Gauge, 18 inches wide or less; prices are all f. o. b. mill:

500 lbs or over	15c. above N. Y. pig tin price
100 to 500 lbs.	17c. above N. Y. pig tin price
Up to 100 lbs.	25c above N. Y. pig tin price

Lighter gauges command "extras" over the above prices.

Supply Prices, May 2, 1932

ANODES

Copper: Cast ..... 17½c. per lb.
Rolled, sheets, trimmed ..... 16⅜c. per lb.
Rolled, oval ..... 14 c. per lb.
Brass: Cast ..... 17 c. per lb.
Zinc: Cast ..... 10½c. per lb.

Nickel: 90-92% ..... 40c. to 45c. per lb.
95-97% ..... 42c. to 46c. per lb.
99% cast, 44c. to 48c.; rolled, depolarized, 45c. to 49c.
Silver: Rolled silver anodes .999 fine were quoted May 4 from 30.25c., per Troy ounce upward, depending upon quantity.

FELT POLISHING WHEELS WHITE SPANISH

Diameter	Thickness	Under 50 lbs.	50 to 100 lbs.	Over 100 lbs.
10-12-14 & 16	1" to 2"	$3.00/lb.	$2.75/lb.	$2.65/lb.
10-12-14 & 16	2 to 3½	3.00	2.70	2.50
6-8 & over 16	1 to 3½	3.10	2.85	2.70-2.75
6 to 24	Under ½	4.25	4.00	3.90
6 to 24	½ to 1	4.00	3.75	3.65
6 to 24	Over 3	3.40	3.15	3.05
4 to 6	¼ to 3	4.85	4.85	4.85
4 to 6	Over 3	5.25	5.25	5.25
Under 4	¼ to 3	5.45	5.45	5.45
Under 4	Over 3	5.85	5.85	5.85

On grey Mexican wheels deduct 10c. per lb. from White Spanish.

COTTON BUFFS

Full disc open buffs, per 100 sections, when purchased in lots of 100 or less:

11" 20 ply 64/68 Unbleached	$13.37 to $14.45
14" 20 ply 64/68 Unbleached	21.60 to 23.70
11" 20 ply 80/92 Unbleached	17.00 to 17.55
14" 20 ply 80/92 Unbleached	26.37 to 28.90
11" 20 ply 84/92 Unbleached	21.69 to 21.90
14" 20 ply 84/92 Unbleached	35.37 to 36.15
11" 20 ply 80/84 Unbleached	21.69 to 21.90
14" 20 ply 80/84 Unbleached	35.37 to 36.15

Sewed Pieced Buffs, per lb., bleached ..... 41c. to 70c.

CHEMICALS

These are manufacturers' quantity prices and based on delivery from New York City.

Acetone	lb.	.09¾-.14
Acid—Boric (Boracic) granular, 99½+% ton lots	lb.	.04½-.05
Chromic, 75 to 400 lb. drums	lb.	.13 -.17½
Hydrochloric (Muriatic) Tech., 20 deg., carboys	lb.	.02
Hydrochloric, C. P., 20 deg., carboys	lb.	.06
Hydrofluoric, 30%, bbls.	lb.	.08
Nitric, 36 deg., carboys	lb.	.06-.06½
Nitric, 42 deg., carboys	lb.	.07-.08
Sulphuric, 66 deg., carboys	lb.	.02
Alcohol—Butyl	lb.	11.30-18.00
Denatured drums	gal.	.356-.436
Alum—Lump, barrels	lb.	.03¾-.04
Powdered, barrels	lb.	.03½-.04
Ammonia, agua, 26 deg., drums, carboys	lb.	.02¾-.05
Ammonium sulphate, tech., bbls	lb.	.03½-.05
Sulphocyanide	lb.	.28-.37
Arsenic, white, kegs	lb.	.04½-.05
Asphaltum	lb.	.35
Benzol, pure	gal.	.58
Borax, granular, 99½+%, ton lots	lb.	.02¼-.02¾
Cadmium oxide, 50 to 1,000 lbs.	lb.	.55
Calcium Carbonate (Precipitated Chalk)	lb.	.05¾-.07½
Carbon Bisulphide, drums	lb.	.05½-.08
Chrome Green, bbls.	lb.	.20
Chromic Sulphate	lb.	.30-.40
Copper—Acetate (Verdigris)	lb.	.23
Carbonate, bbls.	lb.	.14-.20
Cyanide (100 lb. kgs.)	lb.	.39
Sulphate, bbls.	lb.	.038-.05¼
Cream of Tartar Crystals (Potassium Bitartrate)	lb.	.20¼-.20½
Crocus	lb.	.15
Dextrin	lb.	.05-.08
Emery Flour	lb.	.06
Flint, powdered	ton	$30.00
Fluorspar, f.o.b., carload lots	ton	$17.50-32.00
Gold Chloride	oz.	$12.00
Gum—Sandarac	lb.	.26
Shellac	lb.	.32-.34
Iron Sulphate (Copperas), bbls.	lb.	.01½
Lacquer Solvents	gal.	.85
Lead Acetate (Sugar of Lead)	lb.	.13¼
Yellow Oxide (Litharge)	lb.	.12½
Mercury Bichloride (Corrosive Sublimate)	lb.	$1.58
Methanol, 100% synth., drums	gal.	.41½
Nickel—Carbonate, dry bbls.	lb.	.32
Chloride, bbls.	lb.	.20
Salts, single, 300 lb. bbls.	lb.	.10½-.13
Salts, double, 425 lb. bbls.	lb.	.10½-.13
Paraffin	lb.	.05-.06
Phosphorus—Duty free, according to quantity	lb.	.35-.40
Potash Caustic Electrolytic 88-92% broken, drums	lb.	.06¼-.08½
Potassium Bichromate, casks (crystals)	lb.	.08½
Carbonate, 96-98%	lb.	.06¼
Cyanide, 165 lbs. cases, 94-96%	lb.	.50-.60
Pumice, ground, bbls.	lb.	.02½
Quartz, powdered	ton	$30.00
Rosin, bbls.	lb.	.04½
Rouge, nickel, 100 lb. lots	lb.	.25
Silver and Gold	lb.	.65
Sal Ammoniac (Ammonium Chloride) in bbls	lb.	.04½-.05¾
Silver Chloride, dry, 100 oz. lots	oz.	.25¼-.27¼
Cyanide (fluctuating)	oz.	32¾-.40
Nitrate, 100 ounce lots	oz.	.22 -23¾
Soda Ash, 58%, bbls.	lb.	.023
Sodium—Cyanide, 96 to 98%, 100 lbs.	lb.	.16½-.22
Hyposulphite, kegs, bbls.	lb.	.03½-.06½
Metasilicate	lb.	.05-.06¼
Nitrate, tech., bbls.	lb.	.03¼-.07
Phosphate, tech., bbls.	lb.	.03¾
Silicate (Water Glass), bbls.	lb.	.01½
Stannate	lb.	.21
Sulphocyanide	lb.	.30 -.45
Sulphur (Brimstone), bbls.	lb.	.02
Tin Chloride, 100 lb. kegs	lb.	.25½-.27
Tripoli, powdered	lb.	.03
Wax—Bees, white, ref. bleached	lb.	.60
Yellow, No. 1	lb.	.45
Whiting, Bolted	lb.	.02½-.06
Zinc, Carbonate, bbls.	lb.	.11
Chloride, drums, bbls.	lb.	.07½-.10
Cyanide (100 lb. kegs)	lb.	.38
Sulphate, bbls.	lb.	.03½